PB87-158978

RCRA (Resource Conservation and Recovery Act) Guidance Manual for Subpart G Closure and Post-Closure Care Standards and Subpart H Cost Estimating Requirements

ICF, Inc., Washington, DC

Prepared for

Environmental Protection Agency, Washington, DC

Jan 87

U.S. Department of Commerce
National Technical Information Service
NTIS

PB87-158978

RCRA GUIDANCE MANUAL
FOR
SUBPART G CLOSURE AND POST-CLOSURE CARE STANDARDS AND SUBPART H COST ESTIMATING REQUIREMENTS

Prepared by
ICF Incorporated
for
U.S. Environmental Protection Agency

OSWER Policy Directive #9476.00-5

January 1987

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

ICF INCORPORATED

EPA-530-SW 87-010

50272-101

REPORT DOCUMENTATION PAGE	**1. REPORT NO.** [redacted]	**2.**	**3. Recipient's Accession No.** PB87-158978/AS

4. Title and Subtitle
RCRA Guidance Manual for Subpart G Closure and Post-Closure Care Standards and Subpart H Cost Estimating Requirements

5. Report Date
January 1987

6.

7. Author(s)
ICF Incorporated

8. Performing Organization Rept. No.

9. Performing Organization Name and Address
USEPA
401 M Street, S.W.
Washington, D.C. 20460

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
USEPA
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This guidance manual supports 40 CFR Parts 264 & 265 Subpart G (Closure-Post-Closure regulations) and Subpart H (Cost Estimating Rules). This manual is to be used to help regulatory officials implement the closure and post-closure care regulations and to help hazardous waste facility owners and operators prepare closure plans and cost estimates which satisfy these regulations.

Specifically, this manual does the following: clarifies the intent and scope of the closure and post-closure plan and cost estimate regulatory requirements, provides examples of the types of information that should be included in closure and post-closure plans and cost estimates, covers site-specific factors that may affect closure and post-closure care activities, and provides cost and post-closure plan checklists to aid in preparing and reviewing plans.

This guidance supports requirements which apply to interim status and permitted hazardous waste facilities. Also included are closure timelines, discussions of technical criteria and site-specific factors relevant to evaluating the length of the post-closure care period, and closure and post-closure plan checklists for most types of treatment, storage, or disposal units.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement unclassified	**19. Security Class (This Report)** Unclassified	**21. No. of Pages**
	20. Security Class (This Page) Unclassified	**22. Price**

(See ANSI–Z39.18)

See Instructions on Reverse

OPTIONAL FORM 272 (4–77)
(Formerly NTIS–35)
Department of Commerce

TABLE OF CONTENTS

Page

CHAPTER 1. INTRODUCTION 1-1

1.1 SUMMARY OF CLOSURE/POST-CLOSURE CARE REQUIREMENTS 1-2

1.2 ORGANIZATION AND USE OF MANUAL 1-3

CHAPTER 2. CLOSURE AND POST-CLOSURE CARE REQUIREMENTS 2-1

2.1 APPLICABILITY OF CLOSURE AND POST-CLOSURE CARE REGULATIONS ... 2-1

2.1.1 Applicability of Closure Regulations 2-1

2.1.2 Applicability of Post-Closure Care Regulations 2-4

2.1.3 Units Subject to Contingent Plan Requirements 2-5

2.2 CLOSURE REQUIREMENTS TO BE ADDRESSED IN THE CLOSURE PLAN 2-5

2.2.1 Facility Description 2-7

2.2.2 Partial Closure 2-9

2.2.3 Maximum Extent of Operations 2-10

2.2.4 Management of Maximum Inventory 2-10

2.2.5 Facility Decontamination 2-13

2.2.6 Final Cover 2-16

2.2.7 Ground-Water Monitoring 2-17

2.2.8 Ancillary Closure Activities 2-18

2.2.9 Survey Plat 2-21

2.2.10 Closure Certification 2-21

2.2.11 Partial and Final Closure Schedule 2-22

2.3 POST-CLOSURE CARE REQUIREMENTS TO BE ADDRESSED IN THE POST-CLOSURE PLAN 2-23

2.3.1 Scope of Post-Closure Care Activities 2-25

2.3.2 Considerations Affecting the Length of the Post-Closure Care Period 2-32

TABLE OF CONTENTS (continued)

Page

2.4 DESCRIPTION OF DATA SOURCES FOR CLOSURE AND POST-CLOSURE PLANS 2-34

2.4.1 Part B Application 2-35

2.4.2 Facility Operating Record 2-36

2.4.3 Inspection Logs 2-36

2.4.4 Manifests and Other Contracts for Waste Shipments 2-37

2.4.5 Ground-Water Monitoring Data 2-37

2.4.6 Biennial Report 2-37

2.4.7 Part A Application 2-38

CHAPTER 3. PROCEDURAL AND ADMINISTRATIVE CLOSURE AND POST-CLOSURE CARE REQUIREMENTS 3-1

3.1 AVAILABILITY OF PLANS AND COST ESTIMATES 3-1

3.2 CLOSURE AND POST-CLOSURE PLAN AND COST ESTIMATE REVIEW PROCEDURES AND PUBLIC INVOLVEMENT REQUIREMENTS 3-2

3.2.1 Review of Closure and Post-Closure Plans and Cost Estimates by the Regional Administrator or State Director 3-2

3.2.2 Public Involvement Requirements 3-5

3.3 REQUIREMENTS FOR AMENDING CLOSURE OR POST-CLOSURE PLANS AND COST ESTIMATES 3-12

3.3.1 Changes that Require Amendments to Plans and Cost Estimates 3-12

3.3.2 Deadlines for Amending Plans and Cost Estimates 3-14

3.3.3 Procedures for Amending Plans and Cost Estimates 3-15

3.4 CLOSURE SCHEDULE 3-16

3.4.1 Receipt of Final Volume of Hazardous Wastes 3-16

3.4.2 Notification of Closure 3-17

TABLE OF CONTENTS (continued)

Page

3.4.3 Completion of Closure Activities 3-17

3.4.4 Submittal of Closure Certification 3-22

3.4.5 Submittal of Survey Plat 3-22

3.4.6 Submittal of Record of Wastes 3-22

3.4.7 Submittal of Deed Notation 3-25

3.4.8 Release from Financial Assurance 3-27

3.5 PROCEDURES FOR ALTERING THE LENGTH OF THE POST-CLOSURE CARE PERIOD 3-29

CHAPTER 4. INSTRUCTIONS FOR PREPARING CLOSURE AND POST-CLOSURE COST ESTIMATES 4-1

4.1 APPLICABILITY OF COST ESTIMATING REQUIREMENTS 4-1

4.2 BASIC RULES FOR PREPARING COST ESTIMATES 4-3

4.2.1 Relationship Between the Closure and Post-Closure Plans and Cost Estimates 4-4

4.2.2 Scope of the Closure Cost Estimate 4-4

4.2.3 Scope of the Post-Closure Cost Estimate 4-6

4.2.4 Inclusion of Ground-Water Monitoring Costs in Cost Estimates 4-7

4.2.5 First- vs. Third-Party Costs 4-7

4.2.6 Disallowance of Salvage Value and Zero Credit for Sale of Hazardous Wastes 4-8

4.3 REVISING COST ESTIMATES TO REFLECT CHANGES IN CLOSURE AND POST-CLOSURE PLANS 4-9

4.3.1 Changes in the Closure or Post-Closure Plans that May Increase the Cost Estimates 4-9

4.3.2 Changes in the Closure or Post-Closure Plans that May Decrease the Cost Estimates 4-10

4.4 ANNUAL ADJUSTMENTS FOR INFLATION 4-11

TABLE OF CONTENTS (continued)

Page

4.4.1 Options for Updating the Closure and Post-Closure Cost Estimates for Inflation 4-11

4.4.2 Deadlines for Adjusting Cost Estimates for Inflation 4-14

4.5 DOCUMENTATION FOR COST ESTIMATES 4-17

4.5.1 Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H) 4-17

4.5.2 Owner or Operator Experience 4-18

4.5.3 Contractor Estimates 4-18

4.5.4 Cost Estimating Handbooks 4-18

4.5.5 Worksheets and Workups 4-19

APPENDIX A: CLOSURE TIMELINES A-1

A.1 Closure Timelines for Permitted Facilities and Interim Status Facilities With Approved Plans: Surface Impoundments, Waste Piles, Landfills, and Land Treatment Units A-3

A.2 Closure Timelines for Permitted Facilities and Interim Status Facilities With Approved Plans: Container Storage, Tank and Incinerator Units A-4

A.3 Closure Timelines for Interim Status Facilities Without Approved Plans: Surface Impoundments, Waste Piles, Landfills, and Land Treatment Units A-5

A.4 Closure Timelines for Interim Status Facilities Without Approved Plans for: Container Storage, Tank and Incinerator Units A-6

APPENDIX B: TECHNICAL CRITERIA AND SITE-SPECFIC FACTORS TO CONSIDER IN DETERMINING THE LENGTH OF THE POST-CLOSURE CARE PERIOD B-1

B.1 Technical Evaluation Criteria to Consider in Determining the Length of the Post-Closure Care Period B-1

B.1.1 Containment B-2

B.1.2 Detection B-3

TABLE OF CONTENTS (continued)

Page

B.1.3 Migration and Attenuation B-3

B.1.4 Risk Potential B-4

B.2 Site-Specific Technical Factors Involved In Evaluating the Length of the Post-Closure Care Period B-4

B.2.1 Facility Characteristics B-4

B.2.2 Waste Types and Characteristics B-15

B.2.3 Environmental and Health Considerations B-17

APPENDIX C: CLOSURE, CONTINGENT CLOSURE, AND POST-CLOSURE PLAN CHECKLISTS C-1

CHAPTER 1

INTRODUCTION

This guidance manual accompanies the Parts 264 (permitted status) and 265 (interim status) Subpart G closure and post-closure care regulations, and the Subpart H cost estimating rules promulgated on May 19, 1980, and January 12, 1981, and later amended on May 2, 1986. These requirements are found in 40 CFR 264.110-264.120, 264.142, 264.144, 265.110-265.120, 265.142, and 265.144.

The purpose of this guidance manual is to assist the Regional and State Offices in implementing the closure and post-closure care and cost estimate regulations and to help owners and operators prepare plans and cost estimates that satisfy these regulations. In particular, the manual:

- **clarifies the intent and scope** of the closure and post-closure plan and cost estimate regulatory requirements;
- **provides examples** of the kinds of information that should be included in closure and post-closure plans and cost estimates;
- **discusses site-specific factors** that may affect closure and post-closure care activities; and
- **provides closure and post-closure plan checklists** to assist in preparing and reviewing plans.

The information in this manual supersedes guidance contained in two earlier manuals published in November 1981 to accompany the May 19, 1980, interim final rules: Final Draft Guidance for Subpart G of the Interim Status Standards for Owners or Operators of Hazardous Waste Treatment, Storage and Disposal Facilities, and Final Draft Guidance for the Subpart H Cost Estimating Requirements of the Interim Status Standards for Owners or Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. Guidance for future regulatory changes and policies, including determining "how clean is clean", will be published at a later time.

Readers may also wish to refer to two other manuals that address closure and post-closure cost estimates and financial responsibility requirements: Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H), Volumes I-IV, November, 1986, EPA #530-SW-86-036, OSWER Policy Directive Number 9476.00-6; and Financial Assurance for Closure and Post-Closure Care: Requirements for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities, U.S. EPA, Office of Solid Waste, May 1982, EPA #SW-961, NTIS #PB 83-144-675.

1.1 SUMMARY OF CLOSURE/POST-CLOSURE CARE REQUIREMENTS

This section summarizes the key provisions of the closure and post-closure care regulations that are discussed in more detail in later chapters. It should be noted that the closure and post-closure care regulations in 40 CFR Subpart G were revised substantially by regulations published on May 2, 1986, and effective on October 29, 1986. These rules, including the preamble discussing the rationale for the revisions, can be found in 51 Federal Register 16422. The major closure/post-closure care regulatory requirements are as follows:

- Owners or operators must prepare closure and post-closure plans describing in detail the plans and procedures to be followed for conducting closure and post-closure care activities.
- Partial closures must be addressed explicitly in the plans.
- Owners or operators must remove or decontaminate contaminated facility equipment, structures, and soils at partial and final closure.
- Owners or operators must notify the Regional or State Office prior to the beginning of closure of each disposal unit and prior to final closure.
- Certifications by an independent registered professional engineer and the owner or operator that closure has been conducted in accordance with the approved closure plan are required at closure of each disposal unit and at final closure.
- Owners or operators must submit survey plats and post-closure notices after closure of each disposal unit. (Deed notices must be filed subsequent to closure of the first and the last disposal unit.)
- Owners or operators of permitted storage surface impoundments and waste piles not designed in accordance with specified liner design standards, and of all tank systems without secondary containment must prepare contingent closure and post-closure plans describing activities required to close the unit as a landfill and conduct post-closure care.
- Owners or operators not otherwise required to prepare contingent closure and post-closure plans must revise their closure plans and prepare post-closure plans if all hazardous wastes cannot be removed at closure and the unit must be closed as a landfill.

- Owners or operators must begin post-closure care as soon as the unit is closed and continue it for 30 years, or some other period approved by the Regional Administrator or State Director.
- At the completion of the post-closure care period for each unit, an independent registered professional engineer and the owner or operator must certify that the activities were conducted in accordance with the approved plan.
- Cost estimates based on the plans must include the costs of a third party performing closure and post-closure care activities.
- The cost estimates may reflect the costs of a third party managing hazardous wastes on site if capacity will be available at all times over the life of the facility.

1.2 ORGANIZATION AND USE OF MANUAL

This manual is divided into two major parts: Chapters 1 through 4 discuss the closure, post-closure care, and cost estimate regulatory requirements applicable to interim status and permitted facilities; Appendices A through C include closure timelines, discussions of technical criteria and site-specific factors relevant to evaluating the length of the post-closure care period, and closure and post-closure plan checklists for most major types of unit that may be at a facility.

Discussions of specific closure and post-closure care requirements are presented in the following chapters:

Chapter 2	-- Closure and Post-Closure Care Requirements
Chapter 3	-- Procedural and Administrative Closure and Post-Closure Care Requirements (e.g., amending plans and cost estimates; notification requirements; public involvement)
Chapter 4	-- Instructions for Preparing Closure and Post-Closure Cost Estimates
Appendix A	-- Closure Timelines
Appendix B	-- Technical Criteria and Site-Specific Factors to Consider in Determining the Length of the Post-Closure Care Period
Appendix C	-- Closure, Contingent Closure, and Post-Closure Plan Checklists

The closure and post-closure plan checklists in Appendix C have been made consistent with the guidance manual on developing cost estimates: Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H), EPA #530-SW-86-036, OSWER Policy Directive Number 9476.00-6. This cost estimating manual is comprised of four volumes: Volume I includes sample worksheets of cost components applicable to closure of treatment and storage facilities. Volume II of the cost estimating manual includes sample worksheets and costs for waste piles, surface impoundments, land treatment, and landfills, as well as worksheets and costs for a post-closure care cost estimate. Volume III includes ranges of unit costs for closure and post-closure care activities. Volume IV documents sources for the unit cost estimates.

CHAPTER 2

CLOSURE AND POST-CLOSURE CARE REQUIREMENTS

The Subparts G and H regulations include performance-based standards for conducting closure and post-closure care and descriptions of the information that must be included in closure and post-closure plans. This chapter discusses these requirements and is organized as follows:

- Section 2.1 -- Applicability of the closure and post-closure care regulations.
- Section 2.2 -- Information that must be included in the closure plan and sources for this information.
- Section 2.3 -- Information that must be included in the post-closure plan.
- Section 2.4 -- Description of data sources for closure and post-closure plans.

2.1 APPLICABILITY OF CLOSURE AND POST-CLOSURE CARE REGULATIONS

Exhibit 2-1 summarizes the applicability of the closure and post-closure plan regulations to various types of TSDFs. Information in this exhibit will be discussed in the following sections.

2.1.1 Applicability of Closure Regulations

All owners or operators of hazardous waste management facilities must prepare closure plans describing how each unit at the facility will be closed.[1] The closure and post-closure care regulations apply only to those units at the facility that treated, stored, or disposed of wastes after November 19, 1980.[2] If a unit (e.g., landfill cell) or any part of a unit was active on the effective date of the regulations, the entire unit is subject to the closure and post-closure care regulations.

A hazardous waste management unit is defined as the largest area in which hazardous waste constituents may be mixed.[3] Examples of hazardous waste management units include:

---

[1] 40 CFR 264.110(a), 264.112(b)(1), 265.110(a), and 265.112(b)(1).

[2] See definition of "active portion" of a facility, 40 CFR 260.10.

[3] 40 CFR 260.10.

EXHIBIT 2-1

APPLICABILITY OF CLOSURE AND POST-CLOSURE PLAN REQUIREMENTS

Process Type	Closure Plan	Contingent Closure Plan	Post-Closure Plan	Contingent Post-Closure Plan
Interim Status				
Container storage	X			
Tank with secondary containment	X		Only if unit must be closed as a landfill	
Tank without secondary containment	X	X		X
Disposal surface impoundment	X		X	
Surface impoundment at which owner/operator intends to remove ALL wastes at closure	X		Only if unit must be closed as a landfill	
Waste Pile	X		Only if unit must be closed as a landfill	
Land Treatment	X		X	
Landfill	X		X	
Incinerator	X			
Permitted Status				
Container storage	X			
Tank with secondary containment	X		Only if unit must be closed as a landfill	
Tank without secondary containment	X	X		X
Disposal surface impoundment	X		X	
Surface impoundment at which owner/operator intends to remove ALL wastes at closure: unit satisfies liner design standards	X		Only if unit must be closed as a landfill	

EXHIBIT 2-1 (continued)

APPLICABILITY OF CLOSURE AND POST-CLOSURE PLAN REQUIREMENTS

Process Type	Closure Plan	Contingent Closure Plan	Post-Closure Plan	Contingent Post-Closure Plan
Surface impoundment at which owner/operator intends to remove ALL wastes at closure: unit does not satisfy liner design standards	X	X		X
Waste pile: unit satisfies liner design standards	X		Only if unit must be closed as a landfill	
Waste pile: unit does not satisfy liner design standards	X	X		X
Land treatment	X		X	
Landfill	X		X	
Incinerator	X			

- Container storage area (each container is not considered a unit);
- Tank and its associated piping and underlying containment systems;
- Surface impoundment;
- Waste pile;
- Land treatment area;
- Landfill cell or trench area that segregates wastes (a subcell is not a unit);
- Incinerator;
- Thermal treatment unit;
- Area for open burning or open detonation;
- Chemical, physical, and biological treatment unit; and
- Underground injection well (Underground injection wells are subject to a permit issued under an Underground Injection Control (UIC) program under the Safe Drinking Water Act. RCRA regulations apply to aboveground storage or treatment of wastes prior to injection and to injection wells prior to receipt of UIC permit).

2.1.2 Applicability of Post-Closure Care Regulations

The post-closure care regulations under 40 CFR 264.117 through 264.120 and 265.117 through 265.120 apply to owners or operators of all hazardous waste DISPOSAL units[*] -- landfills, land treatment areas, disposal surface impoundments, and storage impoundments, waste piles, and tank systems that cannot be "clean closed" and must be closed as landfills.

The post-closure care period for each unit must begin as soon as the unit is closed and continue for 30 years or some other period specified by the Regional Administrator or State Director (see Section 2.3). Unless an owner or operator can demonstrate that ground-water monitoring results can be distinguished for each unit, the post-closure care period for units closed prior to final closure may need to be extended to be consistent with the post-closure care period of the last disposal unit closed.

---

[*] 40 CFR 264.110(b) and 265.110(b). A disposal facility is defined in §260.10 as:

> "... a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which waste will remain after closure."

2.1.3 Units Subject to Contingent Plan Requirements

PERMITTED storage surface impoundments and waste piles that are not designed in accordance with the specified liner design standards in 40 CFR 264.221(a) and 264.251(a) (e.g., synthetic liners) and are not exempt from these standards, **and permitted and interim status tanks without secondary containment (and not exempt) must prepare closure plans that describe activities necessary to conduct closure under two sets of conditions.** The first plan must describe how the unit will be closed by removing all hazardous wastes and hazardous constituents. **The second is a CONTINGENT closure plan that outlines the closure activities to be undertaken if the unit must be closed as a landfill.** In addition, these facilities must have a **contingent post-closure plan** describing how the disposal units will be monitored and maintained during the post-closure care period.[5] (See Appendix C for closure plan and contingent closure plan checklists for tanks, surface impoundments, and waste piles.) If at closure, all hazardous wastes and hazardous constituents, including hazardous residues, liners, and surrounding contaminated soils are successfully removed, post-closure care will not be required.

For **surface impoundments, waste piles or tank systems** not subject to the contingent plan requirement, **if the owner or operator or Regional Administrator or State Director determines that the unit must be closed as a landfill, the owner or operator must amend the closure plan, prepare a post-closure plan, and comply with the other post-closure care requirements** in 40 CFR 264.117-264.120 or 265.117-265.120.[6] See Section 3.3 for guidance on procedures and deadlines for revising plans.

2.2 CLOSURE REQUIREMENTS TO BE ADDRESSED IN THE CLOSURE PLAN

This section describes the activities which must be described in detail in the closure plan and gives examples of the sources of data that may be helpful to support the discussion of these activities. Exhibit 2-2 lists the activities, indicates the subsections of Section 2.2 where each activity is discussed, and identifies the corresponding regulatory requirement. Closure plan checklists for major types of hazardous waste management units illustrating how these activities may apply to specific process types are presented in Appendix C.

The closure and post-closure care regulations do not specify the format of the plans, the level of detail that must be included, or the types of documentation that should be made available to support the plans. For example, an owner or operator of a multiple-process facility (e.g., a facility with storage tanks, a landfill, and a surface impoundment) may address closure

---

[5] 40 CFR 264.228(c)(1), 264.258(c)(1), 264.197(c)(1) and (2), and 265.197(c)(1) and (2).

[6] 40 CFR 264.110(b)(2) and (3), 264.112(c)(3), 264.118(a), 265.110(b)(2) and (3), 265.112(c)(2), 265.118(a).

EXHIBIT 2-2

CONTENTS OF CLOSURE PLAN

Activities To Be Described in Closure Plan	Section of Manual	Regulatory Citation
Facility Description	2.2.1	§§ 264.111, 265.111
Partial closure activities	2.2.2	§§ 264.112(b)(1), 265.112(b)(1)
Final closure activities based on the maximum extent of operations	2.2.3	§§ 264.112(b)(2), 265.112(b)(2)
Treating, removing, or disposing of the maximum amount of inventory	2.2.4	§§ 264.112(b)(3), 265.112(b)(3)
Facility decontamination	2.2.5	§§ 264.112(b)(4), 264.114, 265.112(b)(4), 265.114
Final cover[1]	2.2.6	§§ 264.112(b)(5), 264.228, 264.258, 264.280, 264.310, 265.112(b)(5), 265.228, 265.258, 265.280, 265.310
Ground-water monitoring[1]	2.2.7	§§ 264.112(b)(5), 265.112(b)(5)
Ancillary closure activities (e.g., leachate management, gas monitoring, run-on and run-off control)[1]	2.2.8	§§ 264.112(b)(5), 265.112(b)(5)
Survey plat[1]	2.2.9	§§ 264.116, 265.116
Closure certification	2.2.10	§§ 264.115, 265.115
Partial and final closure schedule	2.2.11	§§ 264.112(b)(6), 265.112(b)(6)

[1] May not be required at all units or facilities.

of each unit independently or describe certain closure activities on a facility-wide basis (e.g., ground-water monitoring, security provisions, facility decontamination). Regardless of the format chosen for the plans, the plans must always contain enough detail to allow the Regional and State Offices to evaluate whether:

- the activities described in the plan satisfy the regulations;
- the conditions assumed in the plan adequately reflect the true conditions of the facility; and
- the cost estimates are consistent with the activities described in the plan.

Because changes to approved closure plans for permitted facilities require either a permit modification or, for interim status facilities with approved plans, approval from the Regional or State Office including, where applicable, public involvement, the plan should, as closely as possible, reflect the activities that will be conducted at closure. To minimize the burdens of permit modifications and procedures for amending plans for interim status facilities, the owner or operator may wish to include alternative options in the plan if it is difficult to predict future events with certainty. For example, because it may be difficult to predict what off-site capacity will be available at closure, the closure plan could indicate that inventory will be sent off-site either to a landfill or to an incinerator. The cost estimate should reflect the highest cost alternative.

The discussion of each closure activity presented in this section is followed by examples of possible sources of information. Data sources applicable to multiple sections of the plans are described in detail in Section 2.4.

2.2.1 Facility Description

The closure plan should include site-specific information about the facility that will help the Regional or State Office evaluate whether the plan is consistent with overall facility operations and thus will satisfy the closure performance standard. The types of information to include are:

- Facility location;
- General description of hydrogeologic conditions;
- Description of hazardous waste management units at the facility; and
- References to other environmental permits and exemptions.

This information must be included in the Part B application (see 40 CFR 270.14 through 270.29). As a result, if a Part B has been prepared the closure plan can reference the appropriate sections of the application. The contents of these sections are describe below.

2.2.1.1 Facility Location and Size

The facility description should identify the political jurisdiction in which the facility is located and include a topographic map showing hazardous waste management areas, the location of each unit relative to other areas of the facility, buildings, floodplain locations, surface waters, surrounding land uses, and other key topographic features. The description and map should also indicate the location and nature of the security systems, and traffic patterns.

2.2.1.2 Hydrogeologic Conditions

A description of what is known about the hydrogeology of the immediate area should be presented here, including a description of underlying soil and ground-water conditions. Soil class, soil depth and permeability, depth to ground water, identification of aquifers, and ground-water flow rate and direction are the principal pieces of information needed. If applicable, a description of the ground-water monitoring systems and detection program at the facility should also be presented, including location of monitoring wells and sampling and analysis procedures (parameters, frequency). Finally, if the ground water at the facility has been found to be contaminated, a description of the extent of contamination should be included along with the engineered corrective measures that have been and/or are being taken at the facility. In most cases, references to Part B applications, permit conditions, or corrective action orders should provide the necessary information.

2.2.1.3 Description of Hazardous Waste Management Units

This section should describe the design and configurations of each unit at the facility and identify the types and quantities of hazardous wastes handled. The description included here should provide sufficient detail to support the proposed closure and post-closure care procedures.

The description of the facility design should include:

- Size and dimensions of each unit/area;
- Design capacity or throughput;
- Ancillary equipment associated with each unit (e.g., conveyors, decanting equipment, forklifts, etc.); and
- Types of monitoring and containment systems.

A sketch or layout drawing indicating this information is also recommended.

Because the closure plan must account for the maximum extent of operations of the facility, this section should also describe any plans for expanding or modifying the facility over its active life. These plans should be discussed in similar detail to the information required for the existing unit, as described above. For example, an expansion of the drum storage building and corresponding increase in drum storage capacity should be indicated. Including this information in the closure plan for permitted facilities may preclude the need to modify the permit later on. In the case of interim status facilities, the plan should indicate how these intended changes satisfy the restrictions on expansions to interim status facilities listed in §270.72.

The description of wastes handled at the facility should identify the maximum number of hazardous waste types to be handled over the active life of the unit. If additional waste types and quantities are proposed to be handled over what is currently being managed, then these proposed wastes should also be identified.

For each type of hazardous waste managed, the EPA hazardous waste number should be listed, as well as the physical state (e.g., liquid, solid, or gas), and the principal chemical characteristics of the wastes (e.g., dilute aqueous materials contaminated with TCE). Where certain areas of the storage unit are dedicated to managing different types of wastes, these should also be indicated.

2.2.1.4 References to Other Environmental Permits and Exemptions

If closure activities are to involve, in some manner, other environmentally permitted operations at the facility, the appropriate permits (e.g., NPDES, UIC for an injection well used to dispose of hazardous wastes, Air Emission Source, etc.) should be reference in the closure plan. For example, if waste inventory is to be treated and discharged via an NPDES permitted outfall, the key provisions of the permit should be referenced.

The closure plan should include a list of any anticipated waivers or exemptions from the RCRA regulations, and address how these will influence the closure plan. For example, if one of the facility's wastes has been delisted, procedures for handling of waste inventory may be adjusted accordingly. In cases where exemptions have not yet been granted, the owner or operator may wish to present alternative options under both scenarios to avoid the need to revise the plan at a later date if the exemption is granted.

2.2.2 Partial Closure

The closure plan must include a description of all partial closure and final closure activities.[7] **Partial closure is closure of a hazardous** waste management unit at a facility that contains other operating hazardous waste management units. Closure of the last unit is final closure of the facility.

---

[7] 40 CFR 264.112(b)(1) and (2), and 265.112(b)(1) and (2).

Partial closures must comply with Subpart G regulations and the process-specific requirements and be consistent with final closure procedures. Interim measures such as working covers are not considered partial closures because they do not satisfy completely the final cover design standards. All closure activities apply equally to partial and final closures with the exception of notification and certification requirements for tanks, container storage areas, and incinerators. Notification of closure and certification for these nondisposal units is not required until final closure (see Sections 2.2.10 and 3.4).

2.2.3 Maximum Extent of Operations

The closure plan must describe the steps necessary to close the facility at any given time, in the event that the facility unexpectedly was required to stop accepting hazardous wastes and begin closure procedures.[8] This "maximum extent of operations" will include, for example, the maximum inventory and the maximum number of cells even open at a landfill. At some facilities, the estimate of the maximum extent of operations may be equivalent to the maximum design capacity of the facility (e.g., the maximum volume of wastes that can be handled at a tank storage facility is governed by the design capacity). At other facilities, owners or operators may reduce the size of the maximum area ever open at one time by periodically performing partial closures during the course of operations. For example, if an owneror operator routinely closes landfill cells as they reach capacity and never has more than two cells open at the same time, then the maximum extent of operation described in the closure plan would be two cells while the cumulative capacity of the landfill would be ten cells.

2.2.4 Management of Maximum Inventory

The closure plan must describe in detail the procedures for removing, treating, transporting, and disposing of the maximum hazardous waste inventory,[9] AND demonstrate that these activities will be completed within 90 days of receiving the final volume of hazardous waste at the facility.[10] As will be discussed in Section 3.4.3, an owner or operator may request an extension to this 90-day deadline if completion of these activities within the allotted time is not feasible.

---

[8] 40 CFR 264.112(b)(2) and 265.112(b)(2).

[9] 40 CFR 264.112(b)(3) and 265.112(b)(3).

[10] 40 CFR 264.113(a) and 265.113(a).

2.2.4.1 Estimate of Maximum Inventory of Hazardous Waste

The closure plan must include an estimate of maximum inventory including all undisposed hazardous wastes and residues ever on site at any time over the life of the facility. **The amount of inventory on site should never exceed the estimate in the closure plan.** If over the life of the facility the owner or operator increases the amount of inventory, he must revise the estimate upward, unless he can justify to the Regional Administrator or State Director that the inventory accumulation was caused by an unlikely contingency and that the amount of waste will be reduced within a short time to a quantity not exceeding the original estimate.

In estimating the maximum inventory ever on site, an owner or operator must take into account expected periodic accumulations of inventory that occur when predictable events (e.g., adverse weather conditions, which affect landfilling activities, or periodic "down times" for routine maintenance) affect operating procedures during the life of the facility. The estimate of the maximum inventory should include:

- The maximum amount of hazardous wastes, including residues, in all treatment, storage, and disposal units;
- The maximum amount of contaminated soils and residues from drips and spills from routine operations; and
- If applicable, the maximum amount of hazardous wastes from manufacturing/process areas and raw material/product storage and handling areas (e.g., discarded commercial products, see 40 CFR 261.4).

2.2.4.2 Procedures for Handling Hazardous Waste Inventory

The closure plan must include a detailed description of how an owner or operator will handle all hazardous wastes during the partial and final closure period. The procedures must be consistent with the estimate of maximum inventory and with the estimate of the total time required to handle the maximum inventory included in the milestone schedule (see Section 2.2.11.2).

An owner or operator may handle the inventory by:

(1) on-site treatment or disposal if capacity will be available at partial or final closure; or

(2) off-site treatment, storage, or disposal.

(1) On-Site Management. Partial and final closure activities will often be continuations of routine operating practices. Wastes may be handled on site if capacity will be available (either in the unit to be closed or in another unit at the facility) at the time the unit is closed.

The Regional Administrator or State Director may allow an owner or operator to expand or create a new unit at closure to handle wastes if:[11]

- The owner or operator submits a revised Part A permit application proposing to increase the existing design capacity of a unit at a facility;

AND

- The Regional Administrator or State Director determines that the increase in existing design capacity is necessary due to a lack of available capacity, or the changes or additions are necessary to prevent a threat to human health or the environment, or to satisfy Federal, State, or local requirements, including the Subpart G closure requirements.

If a new unit is to be constructed at closure, the plan must include a discussion of these activities. For example, if an owner or operator of a landfill intends to construct an additional cell or trench at closure to handle hazardous waste inventory, the closure plan must describe procedures for constructing the cell, including:

- Excavation;
- Installation of liners, leachate collection systems, and run-on and run-off control systems; and
- Installation of ground-water monitoring wells, if applicable.

(2) **Off-Site Management.**[12] If off site removal or disposal of hazardous waste inventory is planned, the plan should include:

- An estimate of the quantity of hazardous waste to be sent off site;
- A description of any treatment to be performed prior to transport, if applicable;
- An estimate of the approximate distance to the final TSDF to support the estimate of the costs of off-site management; and

---

[11] 40 CFR 270.72(b), (c).

[12] Owners or operators should note that if wastes are sent off site, they must comply with Part 262 generator requirements including manifest, packaging, and labelling requirements.

- A description of treatment or disposal methods at the final TSDF (e.g., incineration, landfilling).

Data Sources

Sources of information included in Section 2.4 that may be useful in developing this portion of the closure plan are:

- Part B application
- Facility operating record
- Manifests and other contracts for waste shipments
- Biennial report

2.2.5 Facility Decontamination

The closure plan must identify all areas requiring decontamination and describe in detail all the steps necessary to decontaminate equipment, structures, and soils during partial or final closure.[13] The closure plan should include:

(1) A **list** of potentially contaminated areas and equipment;

(2) **Criteria** for determining the extent of decontamination needed to satisfy the closure performance standards;

(3) **Procedures** for cleaning, removing, or disposing of contaminated equipment and structures; and

(4) **Methods** for sampling, testing and disposing of contaminated soils.

2.2.5.1 List of Contaminated Equipment, Structures and Facility Areas

The plan must identify the equipment or structures that will require decontaminating at closure. Examples include:

- Tanks;
- Containers;
- Treatment process (e.g., clarifiers, filter presses);

---

[13] 40 CFR 264.112(b)(4) and 265.112(b)(4).

- Drainage pits;
- Spill containment areas;
- Equipment used prior to storage or treatment in tanks and incinerators, such as waste feed systems, bypass systems, drainage systems, conveyors, etc.;
- Piping, pumps, valves;
- Floors and walls of buildings;
- Facility parking lots, roads, and truck staging areas;
- Earth-moving equipment, such as trucks, forklifts, front-end loaders, bulldozers, etc.; and
- Other facility structures units associated with hazardous waste management operations (e.g., dikes, berms, confinement structures).

2.2.5.2 Criteria for Evaluating Decontamination

The closure plan must describe and document the procedures and criteria that will be used in determining the extent of decontamination necessary to satisfy the closure performance standard. The closure performance standard requires the owner or operator to control, minimize, or eliminate the post-closure escape of all hazardous constituents.[14] Agency guidance on determining "how clean is clean" is forthcoming. Until that guidance is available, the plan should describe procedures to be followed to satisfy the closure performance standard.

Similarly, in describing procedures for demonstrating "clean closure" of an impoundment, waste pile, or tank, the closure plan should demonstrate that any hazardous constituents left at the unit will not impact any environmental media in excess of Agency-established exposure levels (e.g., water quality standards and criteria as specified in 45 FR 79318 and 50 FR 30784, November 28, 1980; health-based limits based on verified reference doses developed by EPA's Risk Assessment Forum in ECAO-CIN-475, January 1986, and Carcinogenic Potency Factors developed by EPA's Carcinogenic Potency Factors in OHEA/600-8-85/400F, Sepetember 1985) and that direct contact will not pose a threat to human health and the environment.

2.2.5.3 Decontamination Procedures

The cleaning methods will vary depending on what is being cleaned and on the type of contaminant. Information about decontamination methods and procedures can be found in the Guide for Decontaminating Building, Structures, and Equipment at Superfund Sites, U.S. EPA, Office of Research and Development, March 1985. Until the determined level of decontamination is achieved, all cleaning residues (e.g., sand from sandblasting, waters from rinsing, etc.) are hazardous wastes and must be disposed of as hazardous wastes.

---

[14] 40 CFR 264.111(b) and 265.111(b).

2.2.5.4 Soil Decontamination

All facilities are likely to have some soil contamination as a result of routine drips and spills (e.g., residues on drainage pits, spill containment areas) which must be removed. The closure plan must describe the procedures and criteria to be used for evaluating the extent of soil contamination and demonstrate that the level of decontamination will satisfy the closure performance standard.

The following information should be included in the closure plan:

- The location for background soil measurements and background ground-water and surface-water monitoring; and
- Sampling and analysis methods to be used to evaluate the extent of contamination.

Besides determining soil contamination levels, the closure plan must describe how contaminated soils will be managed at partial or final closure. The plan should include the following:

- An estimate of contaminated soil;
- A description of on-site (if capacity is available) or off-site treatment or disposal of contaminated soils; and
- An estimate of the approximate distance to the off-site TSDF to support the cost estimate.

Data Sources

Sources of information in Section 2.4 that owners and operators may find useful in developing this portion of the plan are:

- Facility operating record
- Inspection log
- Ground-water monitoring data

In addition, owners and operators may find an in-house procedures manual and commercial reference materials useful in preparing the facility decontamination section of the closure plan.

In-House Procedures Manual. Some of the decontamination procedures required at partial and final closure will be consistent with day-to-day housekeeping procedures conducted at the facility. For example, as part of routine operations, residues resulting from drips and spills should be cleaned up as they occur. In-house manuals, which outline procedures for routine housekeeping activities, may be useful sources to consult in preparing the decontamination section of the closure plan.

Commercial Reference Materials. The following EPA guidance manuals and engineering reference materials may provide information about decontamination procedures for facility structures and surrounding soils and about the criteria that are applied to demonstrate effective decontamination:

- Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites, U.S. EPA, Office of Research and Development, EPA/600/2 - 85/028, March 1985.
- Decommissioning Handbook, W.J. Marion and S. Thomas, DOE/EV/10128-1, 1980.
- Engineering and Development Support of General Decontamination Technology for the U.S. Army's Installation Restoration Program. Task 5, Facility Decontamination, W.E. Jones, Defense Technical Information Center, Alexandria, Virginia, Pub. No. 49-5002-0005, July 1982.

2.2.6 Final Cover

If hazardous wastes will remain in the unit after closure, a final cover must be installed to prevent infiltration of run-on or run-off into the unit. **The closure plan should include a detailed description of the design of the cap, which may include drawings, and specifications that demonstrate that the cover will satisfy the closure performance standard**, and a discussion of procedures for cover installation.[15] Engineering sketches or drawings delineating final surface contours of the closed unit may help to demonstrate the adequacy of proposed run-on and run-off structures for erosion and slope stability. The plan should also outline the specifications of the cap (e.g., type of cover materials, thickness of materials).

Data Sources

If units have been previously closed, sketches or engineering drawings and documentation on procedures for installing the cap, including design specifications, labor and materials used, may be available from in-house records.

---

[15] 40 CFR 264.112(b)(5) and 265.112(b)(5).

If an owner or operator does not have information from previous partial closures, the following manuals may provide information relevant for the closure plan:

- Draft RCRA Guidance Document: Surface Impoundments--Liner Systems, Final Cover and Freeboard Control, Chapters E and F only, 1982, available for copying from EPA Headquarters, (202) 382-4654.
- Draft RCRA Guidance Document: Landfill Design--Liner Systems and Final Cover, Chapter E only, 1982, available for copying from EPA Headquarters, (202) 382-4654.
- Evaluating Cover Systems for Solid and Hazardous Waste, EPA #SW-867; GPO #055-000-00228-2. The manual provides a guide to examining soil, topographical, and climatological data and recommends cover evaluation procedures.
- Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, 1985, EPA/530-SW-85-021, available through RCRA Hotline or EPA Headquarters, (202) 382-4654.
- Closure of Hazardous Waste Surface Impoundments, 1982, EPA #SW-873; GPO #055-000-00227-4.
- Permit Writer's Guidance Manual for Hazardous Waste Land Treatment, Storage, and Disposal Facilities, EPA/530-SW-84-004; available through GPO #055-000-00240-1.

2.2.7 Ground-Water Monitoring

Owners or operators of landfills, waste piles, surface impoundments, and land treatment units must comply with the ground-water monitoring requirements of Subpart F during the active life of the facility, including the partial and final closure period.[16] The closure plan must describe the types and frequency of analyses required during the partial and final closure period and maintenance that may be required to ensure that the monitoring equipment is in working order for the start of the post-closure care period. Because the monitoring required during the closure period should be consistent with that conducted during the unit's operation, the closure plan may simply refer to the Part B application, the permit, or the interim status ground-water monitoring plan. If facility conditions change over the course of the facility's active life, the closure plan must be revised to reflect the new ground-water monitoring requirements.

---

[16] 40 CFR 264.90(a) and 265.90(a). Ground-water monitoring requirements apply to permitted, but not to interim status, waste piles.

Data Sources

References can be made to the Part B permit application, or, for interim status facilities, to:

- Ground-water sampling and analysis plan for sampling indicator parameters which outlines procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, and chain of custody. This plan must be kept at the facility;

- Outline of a ground-water quality assessment program which summarizes a ground-water monitoring program more comprehensive than detection monitoring to determine the extent of potential contamination;

- Ground-water quality assessment plan required if contamination has been detected at an interim status facility;

- Records of all ground-water monitoring analyses conducted to date. These records must be maintained throughout the life of the facility, and, for disposal units, throughout the post-closure care period; and

- Annual reports of ground-water monitoring which are sumitted to the Region or State no later than March 1 of each calendar year.

2.2.8 Ancillary Closure Activities

Depending on the type of unit being closed, the following activities may be necessary to ensure that all partial closures and the final closure satisfy the closure performance standards:[17]

- Leachate management;

- Gas monitoring;

- Run-on and run-off control; and

- Security.

---

[17] 40 CFR 264.112(b)(5) and 265.112(b)(5).

2.2.8.1 Leachate Management

The owner or operator must describe in the closure plan procedures for continuing to operate the leachate monitoring, collection, removal, and treatment system during the closure period. In most cases, these procedures should be a continuation of activities conducted during the operating life.[18] For example, if leachate is routinely collected and diverted to a wastewater treatment unit with a NPDES permit, the plan should refer to the permit or Part B application for information or describe the procedures and note the NPDES permit number. If leachate routinely is collected in a tank for periodic removal, the plan should estimate the quantity of leachate that will be collected during the closure period, and specify how it will be disposed.

For units or facilities that will require post-closure care, the closure plan should note that routine maintenance and repairs to the system, such as replacement or reinstallation of parts, will be conducted as needed, to ensure that the leachate monitoring and collection system is operating properly when the post-closure care period begins.[19]

2.2.8.2 Gas Monitoring

Some landfills may be required to have a gas collection and control system for controlling and venting the vertical and horizontal movement of produced gases. If such a system is required as a permit condition, the closure plan should describe how it will be monitored and how gases will be collected and managed during partial and final closure. Again, if these are routine operations, the owner or owner or operator may be able to refer to the permit or permit application. In addition, the plan should describe the types of routine maintenance that may be required to ensure that the system is in working order during the post-closure care period.

---

[18] Leachate collection systems are required for new units, lateral expansions, and replacement units of existing permitted and interim status landfills, surface impoundments, and waste piles. In addition, owners and operators of all surface impoundments must retrofit all units to meet these standards by November 8, 1988. See 40 CFR 264.221, 264.251, 264.301, 265.221, 265.251, and 265.301, and the preamble to the July 15, 1985 codification rule, 50 Federal Register 28705.

[19] Under the current rules, only permitted land disposal units must continue to operate the leachate collection system during the post-closure care period. The Agency proposed on March 28, 1986 (see 51 Federal Register 10706) to require that all permitted and interim status land disposal units continue monitoring and managing leachate until the end of the post-closure care period.

2.2.8.3 Run-On and Run-Off Control

The closure plan must describe the procedures that will be used to ensure that run-on and/or run-off due to rain or melting snow do not infiltrate or erode the final cover. The plan should also describe the methods that will be used to treat, remove, or dispose of the excess water that may accumulate as a result of run-on and run-off and how any temporary containment systems will be decontaminated or removed.

2.2.8.4 Security

All owners or operators of TSDFs must maintain a **security system throughout the closure period** that prevents access of persons or livestock onto the facility, unless it can be demonstrated that access will cause no damage to human health or the environment.[20] The following security devices are required at an operating facility:[21]

- **Signs** with the legend "Danger--Unauthorized Personnel Keep Out," posted at each entrance and at other locations and a 24-hour surveillance system (e.g., television monitoring, guards) which continuously monitors and controls entry onto the active portions of the facility;

OR

- **A fence** surrounding the active portions of the facility and a means to control access to the active portions of the facility at all times.

The closure plan should note which of these security devices will be operating during closure.

Owners or operators may be required to continue any or all of the security measures noted above during part or all of the post-closure period if wastes MAY remain exposed after closure, or access by the public or livestock may pose a threat to human health.[22] Thus, for facilities with disposal units, the closure plan should describe any maintenance that will be required at closure.

Data Sources

In most cases, these ancillary closure activities will be continuations of activities that were conducted throughout the active life of the facility.

---

[20] 40 CFR 264.14(a) and 265.14(a).

[21] 40 CFR 264.14(b) and (c), and 265.14(b) and (c).

[22] 40 CFR 264.117(b) and 265.117(b).

Therefore, the plan may simply cross-reference sections of the Part B permit applcation. Other sources of information in Section 2.4 that owners and operators may find useful are:

- Facility operating record
- Inspection log
- Biennial report

In addition, owners and operators may find information available from the following in-house documents:

- Waste analysis plan outlining analyses to identify leachate characteristics;
- In-house employees' manuals outlining security requirements and procedures for leachate management, and for controlling run-on and run-off; and
- EPA guidance manuals (e.g., Management of Hazardous Waste Leachate, EPA #SW-871; GPO #055-000-00224-0).

2.2.9 Survey Plat

After closure of each disposal unit, an owner or operator must submit **a survey plat, prepared and certified by a professional land surveyor licensed in the State where the facility is located, to the local land authority and to the Regional Administrator or State Director.** The plat must indicate the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks.[23] The closure plan should note the locations of the permanently surveyed benchmarks that will be used as the basis of the survey plat.

Data Sources

Information on licensed land surveyors generally can be found by consulting the yellow pages or the **American Congress on Surveying and Mapping**, located in Falls Church, Virginia.

2.2.10 Closure Certification

As part of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill UNIT, an independent registered professional engineer and the owner or operator must certify that closure has been conducted in accordance with the approved closure plan. Certification

---

[23] 40 CFR 264.116 and 265.116.

of container storage, tank storage or treatment, and incinerator units may be delayed until final closure. Closure of a land treatment unit may be certified by an independent qualified soil scientist in lieu of an independent registered professional engineer. The regulations do not specify the types of registered professional engineers (or qualified soil scientists for land treatment units) that may certify closure.[24] Therefore, owners and operators should consider the training, experience, and other qualifications necessary to properly certify closure when choosing an independent registered professional engineer or soil scientist.

Supporting documentation of the certification must be made available to the Regional Administrator or State Director upon request until the owner or operator has been released from closure financial assurance requirements.[25] The closure plan should describe the types of documentation that will be maintained. At a minimum, the owner or operator should maintain a copy of the professional engineer's or soil scientist's inspection report and results of sampling and analyses which should include the following information:

- Activities conducted during inspections;
- Field reports documenting each on-site visit; and
- List of in-house records that were reviewed (e.g., manifests, sampling data, laboratory results, contractor logs of activities performed, engineering drawings of the cover).

Sample certifications are included in Section 3.4 of this manual.

2.2.11 Partial and Final Closure Schedule

The closure plan must include a schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the **total time required to close** each hazardous waste management unit and the time required for intervening closure activities (e.g., time to remove all inventory, install final cap).[26] Section 3.4 provides additional details on regulatory deadlines for closure activities.

---

[24] 40 CFR 264.115, 264.280(b), 265.115, and 265.280(e). An "independent" engineer cannot be directly employed by the owner or operator, or be the owner or operator himself.

[25] 40 CFR 264.115 and 265.115.

[26] 40 CFR 264.112(b)(6) and 265.112(b)(6).

2.2.11.1 Expected Year of Closure

Owners and operators of the following types of facilities must include an estimate of the expected year of closure in the closure plan:[27]

- **Permitted facilities using trust funds** to demonstrate closure or post-closure care financial assurance AND expecting to close prior to the expiration of the permit;
- **Interim status facilities without approved closure plans; and**
- **Interim status facilities with approved plans using trust funds** to demonstrate financial assurance and with a remaining facility operating life of less than 20 years. (See Financial Assurance for Closure and Post-Closure Care: A Guidance Manual, EPA #SW-955, May 1982, for additional information on payment schedules for owners or operators using trust funds to demonstrate financial responsibility for closure and post-closure care.)

Factors to consider when estimating the expected year of closure are the remaining capacity of the units, projected shutdown of the manufacturing plant, expiration date of contracts with customers who currently send hazardous waste to the facility, and expected retirement date.

2.2.11.2 Milestone Chart of Partial and Final Closure Activities

A milestone chart from which the progress of partial or final closure can be determined should be prepared. There is no required format for the milestone chart. Exhibit 2-3 illustrates one possible format that may be used. Milestone charts may vary depending on the process type and wastes handled, the number of activities, and the length of time the activities will take to implement.

2.3 POST-CLOSURE CARE REQUIREMENTS TO BE ADDRESSED IN THE POST-CLOSURE PLAN

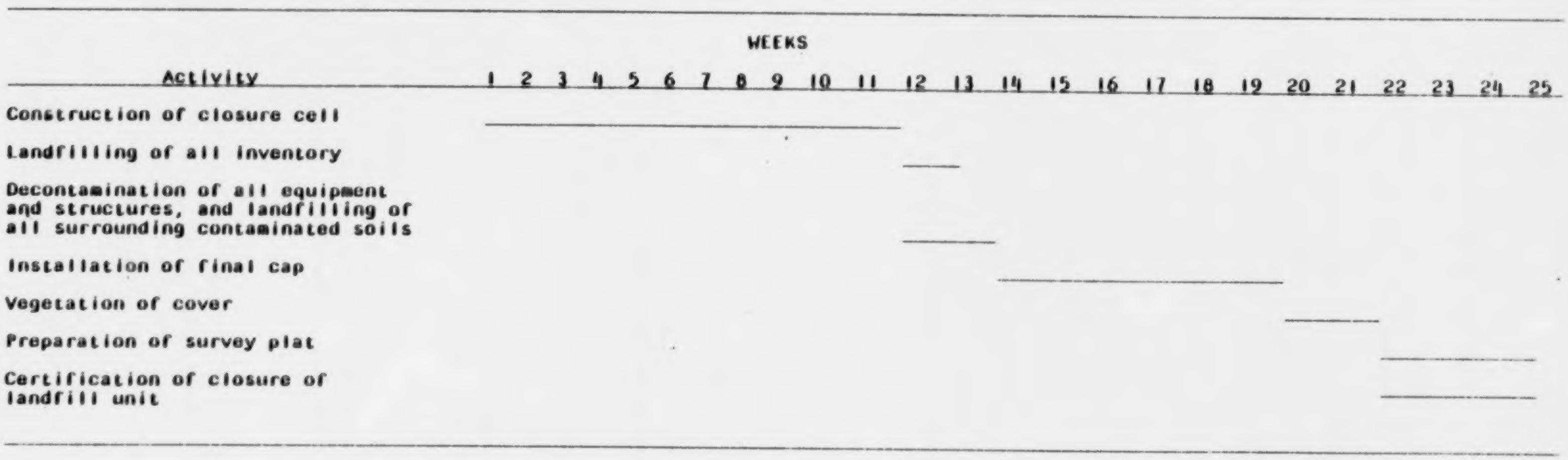
Units or facilities at which hazardous wastes will remain after partial or final closure are subject to post-closure care requirements (see Section 2.1.2) and must have post-closure plans addressing these requirements. As discussed in Section 2.1.3, owners or operators of permitted storage/treatment

---

[27] 40 CFR 264.112(b)(7) and 265.112(b)(7). 40 CFR 264.112(a)(4) and 265.112(a)(4) previously required every owner or operator to include an expected year of closure in the closure plan. The Agency revised this requirement on May 2, 1986 (51 FR 16422).

EXHIBIT 2-3

SAMPLE CLOSURE PLAN MILESTONE CHART
Closure of Landfill Unit



surface impoundments and waste piles not designed in accordance with the specified liner design standards, and permitted and interim status tank systems that do not have secondary containment and must also prepare contingent closure and contingent post-closure plans, unless exempted from these requirements.[28]

2.3.1 Scope of Post-Closure Care Activities

The post-closure plan must address:

- Monitoring and maintenance of the unit or facility;
- Name of contact person during the post-closure care period;
- Filing post-closure care notices; and
- Certification of the completion of post-closure care activities for each unit.

2.3.1.1 Monitoring and Maintenance Activities

The post-closure plan must describe the monitoring and maintenance activities to be conducted after closure of each disposal unit and the frequency of these activities.[29] The post-closure plan should include provisions for the kinds of monitoring and maintenance activities that reasonably can be expected during the post-closure care period. Because it may be difficult to predict with certainty the types of activities that will be required during the post-closure care period, the owner or operator may wish to describe in the plan a range of possible alternatives to avoid modifying the permit or, for interim status facilities with approved plans, following the procedures for modifying approved plans.

Monitoring Activities. The ground-water monitoring activities proposed for the post-closure care period should be consistent with current conditions at the unit or facility.[30] If the ground-water monitoring requirements applicable to the unit or facility change, **the post-closure plan must be revised.**[31] The plan should indicate:

---

[28] 40 CFR 264.228(c)(1), 264.258(c)(1), 264.197(c), and 265.197(c).

[29] 40 CFR 264.118(b)(1) and (2), and 265.118(c)(1) and (2).

[30] 40 CFR 264.90 and 265.90..

[31] If corrective action is required, the post-closure plan does not have to describe the corrective measures to be undertaken. These activities should be addressed in the corrective action plan.

- The number, location, and depth of wells;
- The frequency and procedures for sampling;
- Types of analyses; and
- Party responsible for monitoring activities.

The owner or operator may wish to reference the facility's ground-water monitoring plan included in the permit (or Part B application if a permit has not been issued), or a copy of the ground-water sampling and analyses plan required under 40 CFR 265.92(a).

The post-closure plan must include procedures for operating the leachate collection and removal system during the post-closure care period or until leachate is no longer detected.[32] The description of procedures and a schedule to be followed during the post-closure care period should include:

- Estimated quantity of leachate collected and removed;
- Procedures for collecting and pumping leachate (e.g., leachate may be collected in a sump and pumped out by means of a vacuum truck);
- Procedures for disposing of leachate on site if other units are still operating (e.g., surface impoundments, tanks);
- Procedures for discharging leachate to public waters in accordance with NPDES permit conditions, if applicable;
- Procedures for sending leachate, including any residues from leachate treatment, off site; and
- Party responsible for handling leachate.

At some units or facilities, other types of monitoring activities such as soil monitoring, leak detection monitoring, and gas monitoring may be required. The same guidelines apply to these types of activities as for ground-water monitoring. The discussion of monitoring in the post-closure plan should always be consistent with conditions at the unit or facility. If monitoring activities will differ during the post-closure care period, the plan should explain the reasons for the changes.

---

[32] 40 CFR 264.118 and 264.310(b)(2). Existing units at interim status landfills are not required to have leachate collection and removal systems. Interim status facilities also are not required to manage leachate during the post-closure period. The Agency has proposed in 51 Federal Register 10706 to require that interim status facilities manage leachate during the post-closure care period.

Maintenance Activities. The closure plan must include a description and the planned frequency of all activities necessary to maintain the integrity of the hazardous waste containment systems and the function of the monitoring equipment and security systems, where applicable. **The post-closure plan should include maintenance provisions for any events that reasonably could be expected to occur over a 30-year period**. The owner or operator is not expected, however, to establish the capability to handle extraordinary calamities such as a total liner failure brought about by a major earthquake.

The post-closure plan should include a description and schedule of the following kinds of post-closure maintenance activities that will be needed at most facilities:

- Routine facility inspections;
- Maintenance of the function and integrity of the waste containment system, if applicable;
- Continuation of processes necessary to continue waste degradation at land treatment facilities;
- Maintenance of the monitoring systems; and
- Maintenance of security systems, if applicable.

(1) **Routine Inspections**. The plan should include procedures and a schedule for periodically inspecting all of the facility systems that must be maintained during the post-closure care period. In addition, the plan should also indicate the party responsible for conducting these inspections. If other units of the facility are still operating, inspections of the partially closed areas can probably be integrated into the routine inspection schedule as required under §§ 264.15 and 265.15. The post-closure plan should address explicitly, however, procedures for inspections after the entire facility has been closed when staff may no longer be available for inspections.

Components that should be inspected include:

- Final cover;
- Run-on and run-off control system;
- Surveyed benchmarks;
- Ground-water monitoring system;
- Leachate collection system, if applicable;
- Leak detection system, if a double liner system is present;

- Unsaturated zone soil monitoring system, if applicable; and

- Security systems, if required by the Regional Administrator.

The regulations do not specify the frequency of these activities. The owner or operator should rely on past experience and good engineering practices.

(2) **Maintenance of Waste Containment Systems**. The majority of the routine maintenance operations should be directed at maintaining the integrity of the waste containment systems (i.e., the final cap or vegetation) and controlling erosion. **The post-closure plan must contain a description of the types and frequencies of activities required to maintain the integrity of the final cover and/or vegetation**. If vegetation has not been planted, the post-closure plan should include a description of procedures necessary to stabilize the cover and maintenance to repair damages to the cover caused by routine weather conditions. This may be especially true in the early years of the post-closure care period when the cover may not yet be well established. These activities should include:

- Mowing;

- Fertilizing;

- Reseeding and mulching bald spots and eroded areas;

- Sprinkling;

- Replacing soil lost to erosion;

- Maintaining drainage channels and culverts which direct surface run-on and run-off away from the disposal area and prevent surface water from infiltrating the cover; and

- Controlling rodents as necessary to counter infestations (e.g., filling of rodent burrows, applying insecticide).

The type of activity and the site-specific conditions at the site will affect the frequency of each activity. Some activities will be required annually (e.g., inspections, erosion control, mowing, sprinkling). Others will be required routinely but may not be required with the same frequency over the entire period. For example, fertilization may be required more frequently in the early years of the post-closure care period when the vegetation has not become firmly established.

The frequency of other post-closure care activities, such as the extent to which the final cover will require remedial care, may be more difficult to predict. Because the post-closure plan should describe all activities likely to be required over the 30-year period, the plan should describe contingency plans for damages caused by severe storms or other periodic natural events that could be predicted to occur during the post-closure care period. Much of this information may be based on historical records or the owner's or operator's own experience. The plan may need to be revised as new information becomes available.

(3) **Continuation of Hazardous Waste Degradation at Land Treatment Facilities**. Unlike other process types, **the post-closure care period for land treatment facilities operates in part as an extension of the operating life of the facility**. During the post-closure care period, the owner or operator must continue those activities necessary to enhance degradation and transformation and sustain immobilization of hazardous constituents in the treatment zone.[13] The post-closure care plan should describe procedures for:

- Disking;
- Fertilizing;
- Liming to ensure proper pH balance;
- Irrigating;
- Controlling run-on and run-off from the treatment fields;
- Repairing erosion damage;
- Regrading and replanting as needed; and
- Controlling wind dispersal of particulates.

Because these activities may be needed more frequently in the early years of the post-closure care period, the plan should include a schedule and a discussion of how the proposed schedule of activities will achieve the desired objectives of ensuring the continued degradation of hazardous constituents. The plan should also indicate the party responsible for conducting the activities. The owner or operator must also comply with all food chain crop prohibitions specified in the permit and in 40 CFR 264.276 and 265.276.

---

[13] 40 CFR 264.280 and 265.280.

An owner or operator of a land treatment facility must continue to conduct post-closure care activities until the level of hazardous constituents in the treatment zone no longer exceeds the background value of the constituents by a statistically significant amount.[14] If an owner or operator expects that the constituents will degrade before the end of the 30-year period, he may submit such a demonstration to the Regional or State Office in accordance with the provisions in 40 CFR 264.280(d).

If an owner or operator intends to demonstrate that hazardous constituents are no longer present at the facility, the plan should describe the procedures for making this demonstration, including:

- Constituents requiring reestablishment of background values;
- Number of soil increments to be analyzed; and
- Procedures for conducting analyses to test the level of hazardous constituents in the treatment zone.

(4) Maintenance of the Monitoring Systems. The post-closure plan must describe provisions and include a schedule for maintaining the ground-water and soil monitoring systems, and the leachate collection and leak detection systems, as applicable. Maintenance may include:

- Replacing or redrilling monitoring wells;
- Replacing seals, piping, and caps;
- Repairing or replacing pumps; and
- Other kinds of routine equipment maintenance.

Some of these activities may be required annually, while others will be needed at irregular intervals during the post-closure care period (e.g., ground-water well replacement). Since monitoring during the post-closure care period will generally be a continuation of monitoring performed during facility operations, an owner or operator will gain experience on maintenance needs over the life of the facility. Again, the owner or operator may need to revise the post-closure plan as more data become available.

(5) Maintenance of the Security System. Some hazardous waste disposal units or facilities will be required by the Regional or State Office to maintain security devices (e.g., fences, warning signs) during the post-closure care period. If the owner or operator does not intend to provide for security measures during the post-closure care period, he should explain in the plan why such provisions are not needed to ensure the protection of human health and the environment.

---

[14] 40 CFR 264.280(d).

If security measures will be needed, the post-closure plan should describe the proposed maintenance activities and estimate the frequency of those proposed activities to ensure that the security system remains reliably functional throughout the post-closure care period. For example, if a perimeter fence is required during the post-closure care period, it will periodically require replacement of sections as a result of normal wear, severe weather conditions, and vandalism. Similarly, if a warning sign is required, it will require periodic replacement.

2.3.1.2 Name of Contact Person of Office

The post-closure plan must include the **name, address and phone number of the person or office to contact** about the unit or facility during the post-closure care period.[35] This person must maintain a copy of the post-closure plan during the post-closure care period.

2.3.1.3 Post-Closure Care Notices

Owners or operators of disposal units must submit to the Regional Administrator or State Director and to the local land authority, or authority with jurisdiction over land use, **a record of the type, location, and quantity of hazardous wastes disposed within each disposal unit.**[36] The record must be filed no later than 60 days after certification of closure of each disposal unit.

After closure of the first and last disposal unit, the owner or operator must also record **a notation on the deed to the facility property** noting that the property has been used to manage hazardous wastes, its use is restricted, and a survey plat and record of wastes have been filed with the appropriate local land authority and with the Regional Administrator or State Director. The owner or operator must also **submit to the Regional Administrator or State Director a copy of the notation to the deed and a certification** signed by himself stating that the notation has been filed.[37] Section 3.4 provides further information on the procedural requirements associated with filing these notices.

2.3.1.4 Post-Closure Certification

No later than 60 days after the completion of the 30-year post-closure care period for each unit, the owner or operator must submit to the Regional Administrator or State Director **certifications signed by himself and an independent registered professional engineer** (or an independent qualified soil scientist for land treatment units) stating that post-closure care has been completed in accordance with the approved plan.[38] The guidelines for post-closure certifications and the types of information to be included in the post-closure plan are consistent with the discussion in Section 2.2.10 on closure certifications. The plan should indicate the types of documentation that will be maintained at the facility and made available upon request.

---

[35] 40 CFR 264.118(b)(3) and 265.118(c)(3).

[36] 40 CFR 264.119(a) and 265.119(a).

[37] 40 CFR 264.119(b) and 265.119(b).

The main purposes of the post-closure certification are to verify that the post-closure care activities have been conducted in accordance with the approved plan and to ensure that terminating the post-closure care period will not pose a threat to human health and the environment. The independent registered professional engineer or independent qualified soil scientist obviously will not be able to verify that every activity has been conducted at the specified frequency over the previous 30 years. Therefore, the independent registered professional engineer or independnet qualified soil scientist should use his best judgment based on visual inspections of facility conditions and a review of internal documents (e.g., owner or operator inspection reports, ground-water monitoring results, invoices for maintenance activities) to evaluate whether all post-closure care activities have been performed adequately.

At a minimum, the owner or operator should maintain a copy of the professional engineer's or soil scientist's inspection report and results of any sampling and analyses or soil scientist engineer, which should include the following information:

- Activities conducted during inspections;
- Field reports documenting each on-site visit; and
- List of in-house records that were reviewed (e.g., owner's or operator's log of inspections, laboratory results, chain of custody reports to verify that adequate sampling was conducted, contractor's logs of activities performed).

2.3.2 Considerations Affecting the Length of the Post-Closure Care Period

The Subpart G regulations specify 30 years of post-closure care for each disposal unit, but give the Regional Administrator or State Director the authority to extend or reduce the period on a case-by-case basis. The Regional Administrator or State Director also may temporarily extend or reduce the length of the period or temporarily suspend certain types of activities based on cause. In addition, the owner or operator or any member of the public may petition the Regional Administrator or State Director to alter the length of the post-closure care period.[39]

---

[38] 40 CFR 264.120 and 265.120. (40 CFR 264.280(b) and 265.280(e) allow closure of a land treatment unit to be certified by an independent qualified soil scientist in lieu of an independent registered professional engineer.)

[39] 40 CFR 124.5(a), 265.118(g), and 270.41.

The regulations do not specify the conditions that warrant an extension or reduction of the post-closure care period. Consequently, such determinations will be site-specific based on the facility's expected performance. For example, the period may be reduced if leachate or ground-water monitoring results, characteristics of the hazardous wastes, or management technologies indicate that the hazardous waste management unit is secure. Alternatively, the period may be extended if leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment.[40] At facilities with multiple disposal units that are closed at different times during the facility's life, unless each unit has its own ground-water monitoring system, the Regional Administrator or State Director may find it appropriate to extend the length of the post-closure care period for units previously closed, to be consistent with the post-closure care period for the remainder of the units.

Owners or operators must provide financial assurance to cover the costs of 30 years of post-closure care unless the Regional Administrator or State Director reduces or extends the length of the post-closure care period prior to FINAL closure of the facility. Until final closure of the facility, post-closure cost estimates and the amount of financial assurance must be increased whenever a modification of the post-closure plan increases the cost of post-closure care.[41] Once final closure of the facility has been certified, the amount of financial assurance need not be increased even if the post-closure care period is lengthened. See Section 4.3 of this manual for a discussion of modifications to the post-closure cost estimate. Readers should also refer to Financial Assurance for Closure and Post-Closure Care: A Guidance Manual, May 1982, EPA #SW-955 or NTIS #APB 82-237-595 for information on revising financial instruments.

This section briefly presents some broad technical evaluation criteria and site-specific technical factors that may deserve consideration when evaluating the appropriate length of the post-closure care period. **Appendix B** describes these factors in more detail and presents hypothetical scenarios illustrating how this information might be used to support an extension or reduction in the length of the post-closure care period at a particular facility. This kind of supporting data could also be included in a post-closure plan to justify a request to modify the length of the post-closure care period. In many cases, this information may be available from the facility Part B application. In all cases, decisions will be determined by site-specific conditions.

Four general evaluation criteria are key to determining how well a unit or facility will protect human health and the environment. They are:

(1) Containment - How long will the unit or facility contain hazardous wastes after closure? The liner, cover, and cap are the key components of the containment system. Because all containment systems eventually fail and because many wastes degrade slowly under containment, releases may occur after the end of the 30-year

---

[40] 40 CFR 264.117(a)(2) and 265.117(a)(2).

[41] 40 CFR 264.144(c). and 265.144(c).

post-closure care period. The extent of contamination will depend largely on factors such as waste types and environmental conditions.

(2) Detection - Will monitoring systems at the unit or facility detect releases of hazardous wastes if they should occur? Lags between leachate generation and release, and migration to the monitoring well may delay detection.

(3) Migration and Attenuation - Will the hazardous wastes migrate off site, or will the leachate be attenuated in the environment? The rate at which leachate moves through the environment and the extent to which the wastes degrade will affect the potential for contamination.

(4) Risk Potential - What risks are posed to human health and the environment? The likelihood of exposure and the concentration of leachate at the point of exposure will determine the risks posed.

In addition to these four general evaluative criteria, **three categories of site-specific factors** also should be examined. They are:

(1) Facility Characteristics - How do the type of unit (e.g., landfill vs. land treatment), facility design (e.g., liners), operating practices, and corrective actions required to date influence the ability of a facility to contain wastes over a long period?

(2) Waste Types and Characteristics - Do the chemical and physical properties of the wastes suggest that they are likely to migrate quickly off site or be attenuated? The properties of the wastes (e.g., degradation, solubility) will determine how widely the waste may be dispersed in the environment and, in part, whether a release is likely to lead to human exposure.

(3) Environmental and Health Considerations - How does the population density, uses of ground and surface water, and present and potential surrounding land use affect potential exposures and cumulative levels of risks?

Appendix B applies these considerations to hypothetical facilities and presents possible recommendations. Again, in all cases, site-specific conditions must dictate the decisions.

2.4 DESCRIPTION OF DATA SOURCES FOR CLOSURE AND POST-CLOSURE PLANS

This section contains descriptions of the data sources which may be useful in preparing several components of closure and post-closure plans. These sources include: the Part B application; the facility operating record; the inspection log, manifests and other contracts for waste shipments; ground-water monitoring data; the biennial report; and the Part A application. The particular data needed to describe the individual activities that must be included in a closure or post-closure plan will differ from activity to activity.

2.4.1 Part B Application

All owners or operators who are required to have a permit (with the exception of facilities covered by permits by rule) must submit a Part B application. All interim status facilities with land disposal units were required to submit their Part B applications by November 8, 1985, or lose their interim status on that date. Owners or operators of incinerators were required to submit the Part B application no later than November 8, 1986, or lose interim status on November 8, 1989; owners or operators of all other types of units must submit their Part B applications by November 8, 1988, or lose interim status on November 8, 1992.[42]

Information submitted with the Part B application that may be relevant to the closure and post-closure plan includes:[43]

- General facility description, including location (e.g., location in floodplain, seismic area);
- Topographic map delineating surface waters, surrounding land uses, site boundaries, all hazardous waste units and associated buildings and ancillary structures;
- Chemical and physical analyses of hazardous wastes handled, including the waste analysis plan;
- Description of the security system;
- Copy of the facility inspection schedule;
- Description of procedures, structures, or equipment used to prevent runoff, flooding, etc.; and
- Ground-water monitoring information if required under 40 CFR Subpart F.

In addition to this general information, the Part B application must contain data specific to the units being permitted as outlined in 40 CFR 270.15 through 270.21. Process-specific information includes data on design specifications, monitoring requirements, operating, parameters, waste characterizations, etc.

---

[42] RCRA 3005(c)(2) and 3005(e)(3).

[43] 40 CFR 270.14

2.4.2 Facility Operating Record

All owners and operators of TSDFs are required to maintain a **written operating record** at the facility at all times until final closure[44] that addresses all in-house waste management activities conducted from the time the waste was generated or received from another facility until its ultimate disposal or shipment off site. The operating record must be continuously updated as each additional hazardous waste is received or handled. The following types of information are included in the operating record:

- Description of each hazardous waste handled at the facility, its common name(s), and its EPA hazardous waste number;
- Quantity of each waste handled at all stages of operations. If the waste generated or received is subsequently treated, the operating record should include the physical form and weight before and after treatment;
- Methods used to handle each type of hazardous waste (e.g., evaporation, chemical treatment, landfilling) including any intermediate processing steps;
- Location of each hazardous waste within the facility (e.g., for landfills, the operating record must include a map or diagram indicating the exact location and dimensions of each cell with respect to permanently surveyed benchmarks, the contents of each cell, and the location of each waste type within each cell);
- Results of waste analyses; and
- For land treatment facilities, application rate and dates on which hazardous waste is applied.

2.4.3 Inspection Logs

Owners or operators must develop a written schedule and maintain it at the facility for inspecting monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment. In addition, the owner or operator must record inspections in an **inspection log or summary**. Records must be retained for at least three years from the date of inspection. The records must include at a minimum:

- Date and time of inspection;
- Name of inspector;

---

[44] 40 CFR 264.73 and 265.73.

- Notation of observations made; and
- Nature of any repairs or other remedial actions.

2.4.4 Manifests and Other Contracts for Waste Shipments

If hazardous waste is removed to an off-site facility, these off-site shipments must be accompanied by a **Uniform Hazardous Waste Manifest.**[45] Copies of these manifests must be kept on site for at least three years. The following information may be found on the manifests:

- Type and quantity of each waste included in every shipment;
- Number and types of containers used for each waste type;
- Date of shipment;
- Total quantity of all wastes included in each shipment; and
- Name, address, and EPA ID number of the designated TSDF.

Sources of other applicable information include contract agreements with waste transporters and TSDFs and bills of lading for off-site shipments.

2.4.5 Ground-Water Monitoring Data

Ground-water monitoring data are available from the following sources:

- Ground-water sampling and analysis plan;
- Ground-water monitoring results during the operating life;
- Ground-water assessment outline during the operating life; and
- Corrective action plan, if applicable.

2.4.6 Biennial Report

Generators and owners or operators of TSDFs located in States without an authorized RCRA program must file a report recording their facility's hazardous waste activities of the previous year on a biennial basis (once every two years). State law may also require owners or operators to submit annual or biennial reports of hazardous waste activities. The following information is included in the biennial report -- EPA Form 8700-13A (Generator Report) and 8700-13B (TSDF Report):

---

[45] 40 CFR 262.20, 264.71(c), and 265.71(c).

- A description of each waste that was treated or stored for more than 90 days, or disposed of on site, during the reporting year;
- The name, address, and EPA ID number of all off-site TSDFs used during the reporting year;
- The quantity and identity of each type of waste shipped off-site during the reporting year;
- Quantity of waste shipped to each off-site facility in the preceding year;
- Total quantity of waste handled on site that was in storage on December 31 of the reporting year;
- Handling methods for all wastes handled on site, including handling prior to off-site shipment; and
- Quantity of wastes received from each generator (or the amount generated on site and handled on site).

2.4.7 Part A Application

The Part A application contains information on the types of activities conducted at a TSDF, the types of wastes handled, and the structures of the facilities. The owner or operator of an interim status facility must update the Part A application if hazardous wastes not previously identified in the Part A application are to be handled at the facility, or if additional processes are to be used.[46] Permitted facilities must submit a request to modify their permit. The information required in a Part A application includes the following:

- Design capacity of each unit and each process at the facility;
- Topographic map of the facility indicating the location of each waste management unit;
- Scale drawing of the facility, including designation of areas currently operating and areas of past and future treatment, storage, and disposal activities;

---

[46] 40 CFR 270.72(a), (b), and (c).

- Photographs of the facility clearly delineating all existing structures and existing treatment, storage, or disposal areas;

- A description of each waste handled at the facility by EPA hazardous waste number;

- List of other environmental permits under other EPA programs (e.g., NPDES permit under the Clean Water Act allowing a point source discharge; ocean dumping permit under the Marine Protection, Research, and Sanctuaries Act) which will ensure that procedures for handling wastes at partial or final closure are consistent with other facility requirements.

CHAPTER 3

PROCEDURAL AND ADMINISTRATIVE CLOSURE AND POST-CLOSURE CARE REQUIREMENTS

This chapter describes procedural and administrative requirements that apply to owners or operators of TSDFs. These requirements are discussed in the following sections and include:

Section 3.1 -- Availability of plans and cost estimates;

Section 3.2 -- Closure and post-closure plan and cost estimate review procedures and public involvement requirements;

Section 3.3 -- Requirements for amending the closure or post-closure plans and cost estimates;

Section 3.4 -- Closure schedule; and

Section 3.5 -- Procedures for altering the length of the post-closure care period.

3.1 AVAILABILITY OF PLANS AND COST ESTIMATES

Owners or operators must include a copy of their closure and post-closure plans and most recent cost estimates with their Part B applications. The reviewed and approved plans will be incorporated as a condition of the permit. (Cost estimtes are not part of the permit.) Owners or operators of interim status facilities must submit their plans for approval to the Regional or State Office prior to final closure or closure of the first disposal unit to be closed after October 29, 1986,[1] whichever is earlier (see Section 3.2). In some cases, approval of the closure and post-closure plans may precede receipt of a permit. For facilities with permits or approved plans under interim status, the most recent approved plans should be available at the Regional or State office.

Until final closure of the facility has been certified, copies of the closure and post-closure plans and all plan revisions must be made available to the Regional Administrator or State Director, or his authorized representatives, upon request, including request by mail.[2] (In the case of permitted facilities and interim status facilities with approved plans, the plans already should be on file with EPA.) Interim status facilities without approved plans must furnish the most current plans on the day of a site inspection.[3] If an owner or operator maintains the plans at an office other than at the facility (e.g., corporate headquarters), the owner or operator must be certain that a copy of the most current plans can be delivered quickly in the event of an inspection.

---

[1] The May 2, 1986 rule (effective on October 29, 1986) required closure plans to be submitted prior to closure of the first disposal unit. Before the May 2, 1986 rulemaking, plans were submitted for approval prior to final closure of the facility.

[2] 40 CFR 264.112(a)(2), 264.118(c), 265.112(a), 265.118(b).

After final closure of the facility has been certified, a copy of the approved post-closure care plan must be kept by the contact person or office indicated in the plan during the remainder of the post-closure care period.[4] If the contact point changes during the post-closure care period, the owner or operator will be responsible for notifying the Regional Administrator of the change. Because the contact is described in the post-closure plan, a change in the name, address, or phone number during the post-closure period will require an amendment to the plan (as a change in operating plans) and a minor modification of the post-closure permit (40 CFR 270.42 describes requirements for minor modifications of the permit).

Until final closure, the owner or operator must keep the latest closure and post-closure cost estimates at the facility as part of the facility operating record.[5] These cost estimates must be furnished upon request and made available at all reasonable times for inspection.[6] Although the regulations do not require explicitly that the cost estimate for post-closure care be retained after the end of the active life of the facility, an owner or operator should retain a copy at the contact point for reference purposes.

3.2 CLOSURE AND POST-CLOSURE PLAN AND COST ESTIMATE REVIEW PROCEDURES AND PUBLIC INVOLVEMENT REQUIREMENTS

Closure and post-closure plans must be approved by the Regional Administrator or State Director and are subject to public review. This section addresses the procedures for submitting and reviewing closure and post-closure plans and cost estimates, and describes public involvement in these activities.

3.2.1 Review of Closure and Post-Closure Plans and Cost Estimates by the Regional Administrator or State Director

The requirements for review of closure and post-closure plans and cost estimates by the Regional Administrator or State Director vary depending on whether the owner or operator of the facility is applying for a RCRA permit, is already operating with a permit, or is operating under interim status. **Plans and cost estimates for a facility seeking a permit or a permit modification, must be submitted to the Regional Administrator or State Director for review in the following situations:**

---

[3] 40 CFR 265.112(a) and 265.118(b).

[4] 40 CFR 264.118(c) and 265.118(b).

[5] 40 CFR 264.73(b)(8), 264.142(d), 264.144(d), 265.73(b)(7), 265.142(d) and 265.144(d).

[6] 40 CFR 264.74(a) and 265.74(a).

- Closure and post-closure plans and the most recent cost estimates, including contingent plans and estimates, must be submitted with the Part B permit application.[7]

- Amended closure or post-closure plans must be submitted with a written request for a permit modification to authorize a change in the approved closure or post-closure plan (amended cost estimates need not be submitted).[8]

- Amended closure or post-closure plans prepared by the owner or operator of a surface impoundment, waste pile, or tank unit not otherwise required to have a contingent closure or post-closure plan must be submitted following a decision by the owner or operator or the Regional Administrator or State Director that the unit must be closed as a landfill.[9]

- Amended closure or post closure plans must be submitted in response to a request by the Regional Administrator or State Director to modify the closure or post-closure plans.[10]

The procedures outlined in 40 CFR Parts 124 and 270 will apply to the plan review.

Closure and post-closure plans for an interim status facility must be submitted to the Regional Administrator or State Director for review in the following situations: (An owner or operator of an interim status facility is not required to submit the cost estimates for review until the Part B application is sumbitted, or unless they are requested explicitly under the provision of 40 CFR 265.74.)

---

[7] 40 CFR 270.14(b)(13), (15), and (16).

[8] 40 CFR 264.112(c) and 264.118(d).

[9] 40 CFR 264.112(c)(3), 264.118(a) and (d), and 264.197(c).

[10] 40 CFR 264.112(c)(4) and 264.118(d)(4).

- Owners or operators of land disposal units without approved closure and post-closure plans must submit those plans 180 days prior to the date the owner or operator expects to begin closure of the first land disposal unit or final closure, whichever is earlier. Owners or operators of facilities with no land disposal units must submit their plans 45 days prior to final closure.[11]

- Owners or operators of surface impoundments, waste piles, or tanks with secondary containment who intended to remove all hazardous wastes at closure must submit revised plans following a decision by the owner or operator or by the Regional Administrator or State Director that the unit must be closed as a landfill.[12] The revised closure plan must be submitted within 60 days of the determination that the unit must be closed as a landfill (or 30 days if the determination occurs during the closure period). The post-closure plan must be submitted within 90 days.

- If the closure or post-closure plans have been approved, modifications to the closure or post-closure plans must be submitted with a written request to the Regional Administrator or State Director to authorize a change to the approved closure or post-closure plans.[13]

- Closure and post-closure plans must be furnished upon request by the Regional Administrator or State Director.[14]

Once the Regional Administrator or State Director has received the closure and post-closure plans for an interim status facility, he will take the following steps:[15]

---

[11] 40 CFR 265.112(d)(1) and 265.118(e). Owners or operators who closed disposal units prior to the effective date of the May 2, 1986 rules -- October 29, 1986 -- must submit their plans for approval prior to closure of the next disposal unit or final closure, whichever is earlier.

[12] 40 CFR 265.112(c)(3), 265.118(a) and (d)(3) and (4), and 265.197(b).

[13] 40 CFR 265.112(c) and 265.118(d).

[14] 40 CFR 265.112(a) and 265.118(b).

[15] 40 CFR 265.112(d)(4) and 265.118(f).

(1) **Publish a newspaper notice** no later than 30 days after receiving the plans to provide an opportunity for public comments on the plan. (The public involvement requirements are described in more detail in Section 3.2.2.)

(2) **Within 90 days** after receipt of the plans, the Regional Administrator or State Director will **approve, modify, or disapprove them.**

(3) If the Regional Administrator or State Director does not approve the plans, he must provide the owner or operator with a **detailed written statement of the reasons**. Within 30 days after receiving the written statements of reasons why the plan was not approved, the owner or operator must modify the plan, or submit a new plan for approval.

(4) The Regional Administrator or State Director will either approve the new or modified plan within 60 days after he receives it, or he will modify the plan. The plan, as modified by the Regional Administrator or State Director, then becomes the approved closure or post-closure plan. A copy of the modified plan with a detailed statement of reasons for the modifications will be mailed to the owner or operator. Exhibit 3-1 provides a sample letter (and a detailed statement of reasons) accompanying a modified closure plan.

3.2.2 Public Involvement Requirements

All closure and post-closure plans, including revisions to the plans that are considered major permit modifications or major modifications to approved interim status plans, are subject to public notice and comment.[16]

The purposes of the public notice and comment requirements are to:

- Allow members of the public who might be affected by the closure and post-closure care of the facility to review and recommend changes to the closure and post-closure plans;

---

[16] 40 CFR 124.5, 124.10, 265.112(c)(3), 265.118(d)(4), and 270.41.

EXHIBIT 3-1

SAMPLE LETTER FROM REGIONAL ADMINISTRATOR MODIFYING CLOSURE PLAN*

RE: Resource Conservation and
Recovery Act (RCRA)
EPA I.D. #

Dear ____________:

EPA has reviewed the closure plan submitted by ________________________ on ______________, and with this letter we are transmitting the modified closure plan. Pursuant to the regulations at 40 CFR 265.112(c), this modified plan is the approved plan and it must be implemented within the stipulated time period. We have included in the Attachment to the Plan all the modifications that we deemed necessary under the regulations. This Attachment is to be treated as part of the Plan as if fully integrated therein.

[Summary of modifications]

EPA's major concern with the plan relates to _________________________. The RCRA regulations require greater detail in the description of the procedures for _________________________. The closure plan has been modified accordingly.

Sincerely,

Regional Administrator

---

* If the facility is in an authorized State, these requirements will be fulfilled by the State Director instead of the Regional Administrator.

EXHIBIT 3-1 (continued)

SAMPLE CLOSURE PLAN APPROVAL FOLLOWING MODIFICATION BY REGIONAL ADMINISTRATOR*

CLOSURE PLAN FOR CLOSURE OF ____[Facility Name]____
AT ____[Location]____

The facility operator, ____________________, and the facility owner, ____________________, submitted a proposed plan for the closure of the ____________________ to EPA on ______________, as required by the federal hazardous waste regulations. Pursuant to 40 CFR 265.112(c), EPA has modified the proposed plan, thereby making this modified plan the approved plan.

The facility operator must conduct the closure activities of this plan within the specified time periods.

Approval of this plan is based on the premise that the information submitted in the proposed closure plan is accurate and that the closure activities will be implemented as specified in the plan.

Approval of this plan has been duly authorized by:

____________________	____________________
Director Waste Management Division	Regional Administrator
____________________	____________________
Date	Date

---

* If the facility is in an authorized State, these requirements will be fulfilled by the State Director instead of the Regional Administrator.

EXHIBIT 3-1 (continued)

SAMPLE PLAN MODIFICATIONS AND DETAILED EXPLANATION*

ATTACHMENT: EPA Modifications to Closure Plan

A) The steps for cleaning the heat exchanger described on page 2 are modified as follows:

"1. An 8 percent hydrochloric acid solution will be heated to between 160 and 180°F and circulated continuously through the exchanger for about three hours. It will be discharged with the dissolved scale and deposits to a storage tank supplied by the operator. The exchanger will then be water flushed to remove acidic residues. The water will be discharged to the storage tank."

"2. A pressure test will be conducted to verify the integrity of the exchanger. The pressure test will be conducted by pressurizing the exchanger to one and one-half (1.5) times the operating pressure, but not over maximum design pressure of the tubes. This elevated pressure will be held for a period of time not less than one hour. EPA will allow a deviation of .01 percent during this test. The front plate to the unit will be removed and visually inspected for leaks during testing. Should the unit fail the pressure test or if visual leakage is observed, then the unit will be dismantled and both sides cleaned. The collected waste from cleaning will be handled as listed hazardous waste K050 and shipped to an EPA approved disposal facility."

"3. A 1 percent soda ash solution will be circulated for corrosion control to ensure that a neutral or slightly basic condition exists in the heat exchanger."

"4. Lime will be added to the wastewater/acid solution in the storage tank until a pH of 8.5 is reached for precipitation of trivalent chromium. The treated waste will then be pumped and water flushed out of the tank to the sewer (leading to the separator and pond system) where solids will settle out in the separator. This procedure is consistent with 40 CFR 261.3."

This modification is required for two reasons: First, the closure plan, as submitted, did not describe how the pressure test would be conducted or the actions that would be taken in case of failure. Second, the closure plan, as submitted, did not provide for steps to remove scale prior to testing. Removal of scale will allow any cracks in the tubes to be more easily noticed and recorded.

---

* If the facility is in an authorized State, these requirements will be fulfilled by the State Director instead of the Regional Administrator.

- Provide procedures and deadlines for public comment on the plans to facilitate communication between the owner or operator, the public, and the Regional Administrator or State Director concerning contents of the plans; and

- Clarify any issues concerning the plans.

3.2.2.1 Public Involvement in the Permitting Process

For many facilities, public notice and comment on the closure and/or post-closure plans and cost estimates will occur during the permitting process.[17] Following public notice that the draft permit is available, interested persons will be given a minimum of 45 days to comment on the draft permit, including the closure and post-closure plans in the permit. If written opposition to the Agency's intent to issue a permit and a request for a hearing are received during the comment period, a public hearing must be held.[18] The Regional Administrator may also, at his own discretion, decide to hold a public hearing. For example, he may wish to hold a hearing if he believes it would clarify any issue concerning the plan. Notification of the hearing is issued at least 30 days prior to the scheduled date of the hearing, and the public comment period is extended until the close of the public hearing.

Public notice and comment during the permitting process is not addressed in this guidance manual. EPA has prepared a Guidance Manual on Public Involvement in the RCRA Permitting Program, OSWER Policy Directive Number 9500.00-1A, (herein called Guidance on Public Involvement) that outlines the key activities during the permitting process for implementing the Agency's policy on public involvement and provides guidance on techniques for conducting public involvement activities. Portions of the Guidance on Public Involvement discuss specifically the role of the public in reviewing plans and should be referred to directly.

3.2.2.2 Public Involvement for Facilities Closing Under Interim Status

Requirements for public notice and comment and hearings for interim status facilities are triggered by the following circumstances:

- When the owner or operator submits a closure or post-closure plan for approval.[19]

---

[17] 40 CFR 264.112(a)(1), 264.118(a), 270.14(b)(13), (15), and (16), 124.10, and 124.11.

[18] 40 CFR 124.12.

[19] 40 CFR 265.112(d)(4), 265.118(f).

- When the owner or operator submits a request for a major modification to the approved closure or post-closure plan.[20]

- When the Regional or State office, owner or operator, or a member of the public proposes to alter the length of the post-closure care period.[21]

Upon receipt of a closure or post-closure plan from the owner or operator, the **Regional Administrator or State Director must provide the owner or operator and the public, through a newspaper notice, the opportunity to submit written comments on the closure or post-closure plan** and request that modifications to the plan be submitted no later than 30 days from the date of the notice.[22] Thirty-day public notice must also be provided when the owner or operator requests a major modification to the closure or post-closure plan, or when the Regional Administrator or State Director decides that such a major modification must be made.

The following procedures should be adopted for a newspaper notice to ensure that adequate notice is given and an adequate record that the formal notice was given is preserved. (Additional guidance is provided in Guidance on Public Involvement.):

- Separate notices should be published for the closure plan and the post-closure plan to avoid any possibility of a subsequent challenge to the sufficiency of the notice, on the grounds that a consolidated notice was confusing or lacked specificity.

- The notice should be clearly labeled "Public Notice."

- The notice may appear in the legal notice section of the newspaper or some other local-events section of the newspaper, and should be printed preferably in the lower left-hand corner of the right-hand page.

- The Regional Administrator or State Director should place the notice in a general circulation paper published, if possible, in the county where the facility is located.

Readers may wish to refer to Chapter 4, Section 4.5 of the Guidance on Public Involvement which discusses various techniques for promoting the effectiveness of a public notice and provides evaluative questions for assessing the quality of the public notice. The Appendices to that manual provide samples of different formats of both required and suggested RCRA public involvement materials. In particular, Appendix B of that guidance manual contains sample public notices for facility closure and corrective action.

---

[20] 40 CFR 265.112(c) and 265.118(d).

[21] 40 CFR 265.118(g).

[22] 40 CFR 265.112(d)(4) and 265.118(f).

The Regional Administrator or State Director, in response to a request or at his own discretion, may hold a public hearing.[23] Thirty-day notice of a hearing must be provided to the public. In providing notice of the hearing, the Regional Administrator should adopt the following procedures:

- If there is a strong likelihood, based on the Regional Administrator's initial assessment of the plan and knowledge of the degree of public interest in the plan, that a hearing will eventually be held, the Regional Administrator should give notice of the hearing at the same time that notice is given of the opportunity to comment on the plan.

- The notice of hearing should identify the matters to be discussed at the hearing, with an indication of the Agency's tentative determination (if any) concerning those matters provide the date and place of the hearing, and explain how persons wishing to present testimony can notify the Regional Administrator or State Director of their intent to participate. Examples of public hearing notices and registration forms are included in Appendix B of Guidance on Public Involvement.

- Newspaper notice of a hearing should be provided according to the same basic procedures described previously for giving newspaper notice of opportunity to comment.

Additional information on the types of information that should be addressed at a public hearing and formats for scheduling hearings is included in the Guidance on Public Involvement. In addition, the reader should refer to a U.S. Department of Justice Technical Assistance Guide (TAG) for instructions on accommodating the mobility, hearing, and visually impaired as required by the Rehabilitation Act. The TAG is comprised of three sections: (1) Access to public meetings, (2) Assistive Listening Devices, and (3) Access to printed information by visually impaired persons.[24]

---

[23] 40 CFR 265.112(d)(4), 265.118(f), and (g).

[24] TAG-5-85-1 specifies, for example, the steps to ensure the hearing impaired recieve notification of public hearings, the number and qualifications of interpreters and signers that should be provided, facility conditions that would render the interpreters and signers most effective, special instructions for formatting printed materials, facility lighting specifications, instructions for those delivering oral presentations, recommendations for seating arrangements, and extra personnel that may be necessary. TAG-5-85-2 describes various types of Assistive Listening Devices (ALDs) used as alternatives to conventional amplification systems. TAG-5-85-3 discusses how to accommodate the visually impaired person by adjusting specific printing factors that affect the readability of printed material (e.g., type size, type selection, line leading, proportional spacing and hyphenation, columns, paragraphs, contrast and color, finish, and color screens and reversals).

3.3 REQUIREMENTS FOR AMENDING CLOSURE OR POST-CLOSURE PLANS AND COST ESTIMATES

Owners or operators must amend closure or post-closure plans and cost estimates as necessary to remain consistent with facility conditions. This section describes:

- The factors specified in the regulations that require amendments to the plans and cost estimates;
- When amendments to the plans and cost estimates must be made; and
- The procedures to be followed.

3.3.1 Changes that Require Amendments to Plans and Cost Estimates

Owners or operators must amend closure and post-closure plans if:[25]

(1) A change in operating plans or facility design affects the closure or post-closure plan, or

(2) An unexpected event occurs while conducting partial or final closure activities, that affects the closure plan, or

(3) An unexpected event occurs during the active life, including partial and final closures, that affects the post-closure plan, or

(4) There is a change in the expected year of closure for facilities required to include an expected closure date in the closure plan.

Chapter 4 discusses the conditions under which the cost estimates must be revised.

The following are examples of changes in facility design or operation that would require a revision to the closure or post-closure plan:

- Increases in facility size and/or capacity;
- Changes in the partial closure schedule (e.g., an owner or operator partially closes a landfill less frequently than originally intended, thus increasing the maximum extent of the operation);

---

[25] 40 CFR 264.112(c)(2), and 264.118(d)(2), 265.112(c)(1), and 265.118(d)(1).

- Increases in the estimate of maximum inventory;
- Changes in regulatory requirements that affect closure or post-closure care activities (e.g., new treatment standards imposed as a prerequisite for landfilling certain wastes);
- Shifts from on-site to off-site disposal of wastes at closure;
- Requirements for more extensive ground-water monitoring as a result of an owner's or operator's operating experience or the availability of new data that were previously unavailable (e.g., increases in the number of samples taken or in the frequency of sampling);
- Contingencies that arise during the active life or the post-closure care period that affect the types of activities that will be required at closure or during the post-closure care period (e.g., as a result of a spill, more contaminated soil removal will be necessary at closure);
- Extensions or reductions to the length of the post-closure care period for one or more units;
- Changes in routine post-closure maintenance activities, including changes in the nature and frequency of the activities required (e.g., a more extensive erosion control program is required); and
- Changes in surrounding land use (e.g., an increase in population density surrounding the facility warrants increased security provisions during the post-closure care period; expanded ground-water monitoring requirements due to a change in how the underlying ground water is used).

If an unexpected event occurs while performing partial or final closure activities which affects the closure plan, or if an unexpected event occurs which affects the post-closure plan, the owner or operator must revise the plans.[26] For example, if an owner or operator of a storage surface impoundment, waste pile or tank unit not otherwise required to prepare a contingent plan cannot remove ALL wastes at closure, he must close the unit as a landfill, and amend the closure plan to reflect this unexpected event. In addition, the owner or operator must prepare a post-closure plan.

---

[26] 40 CFR 264.112(c)(2), 264.118(d)(1), 265.112(c)(1), and 265.118(d)(1).

3.3.2 Deadlines for Amending Plans and Cost Estimates

The regulations establish four deadlines for amending closure or post-closure plans and cost estimates:

(1) For both permitted and interim status facilities with plans approved prior to final closure, requests to amend the closure plan may be made at any time prior to the notification of partial or final closure of the facility.[27] Requests to amend the post-closure plan may be made at any time during the active life of the facility or during the post-closure care period.[28]

(2) Requests to revise the plans must be made at least 60 days PRIOR to a change in facility design or operation or no later than 60 days AFTER an unexpected event occurs which affects the plans.[29] If the unexpected event occurs during the partial or final closure period and affects the closure plan, the request to modify the closure plan must be made no later than 30 days AFTER the event has occurred.[30]

(3) If an owner or operator of a storage surface impoundment, waste pile, or tank not otherwise required to prepare a contingent closure plan must close the unit as a landfill, he must submit an amended closure plan to the Regional Administrator.[31] If closure has not yet begun, the amended plan must be submitted no later than 60 days after the date that it is determined that the unit must be closed as a landfill. If the determination is made during partial or final closure, the amended plan must be submitted no later than 30 days from the date of the determination that the unit must be closed as a landfill. An owner or operator must also prepare and submit a post-closure plan for approval no later than 90 days after the date it is determined that "clean closure" is not practicable and that the unit must be closed as a landfill.[32]

---

[27] 40 CFR 264.112(c)(1) and 265.112(c).

[28] 40 CFR 264.118(d)(1) and 265.118(d).

[29] 40 CFR 264.112(c)(3), 264.118(d)(3), and 265.112(c)(2), and 265.118(d)(3).

[30] 40 CFR 264.112(c)(3) and 265.112(c)(3).

[31] 40 CFR 264.112(c)(3), 264.197(c), 265.112(c)(3), and 265.197(c). The decision to close an interim status unit as a landfill constitutes a change in facility operations which requires an amendment to the plans under 265.112(c)(3).

[32] 40 CFR 264.118(d)(3), 264.197(b), 265.118(d)(3), and 265.197(b).

(4) Cost estimates must be revised if a modification to the closure or post-closure plan increases the cost estimate. For interim status facilities without approved plans, the cost estimates must be revised no later than 30 days after a revision has been made to the closure or post-closure plan. For a permitted facility or an interim status facility with an approved plan, the cost estimates must be revised no later than 30 days after the Regional Administrator has approved a request to modify the closure or post-closure plan.[33]

3.3.3 Procedures for Amending Plans and Cost Estimates

The procedures for amending closure and post-closure plans and cost estimates differ depending on whether the facility is permitted or has interim status.

For permitted facilities, the approved closure and post-closure plans (but not the cost estimates) become conditions of the RCRA permit. Therefore, amendments to the plans require a permit modification. For interim status facilities with approved plans, the owner or operator must obtain approval from the Regional Administrator or State Director to amend the plans.[34] In both cases, the owner or operator must take the following steps:[35]

(1) Submit a written request to the Regional Administrator or State Director for a permit modification to authorize a change in the approved closure or post-closure plan (or for approval to amend the plans for interim status facilities) in accordance with the deadlines listed in Section 3.2.2;

and

(2) Include in the written request a copy of the amended closure plan or the amended post-closure plan for approval by the Regional or State Office.

The Regional Administrator or State Director will approve, disapprove, or modify the amended plan and, for permitted facilities, modify the permit in accordance with the procedures in 40 CFR Parts 124 and 270.

For interim status facilities without approved plans, the owner or operator must amend the closure and post-closure plans as required to keep those plans up to date. The amendments need not be submitted to the Regional Administrator or State Director unless requested.

---

[33] 40 CFR 264.142(c), 264.144(c), 265.142(c), and 265.144(c).

[34] 40 CFR 265.112(c) and 265.118(d).

[35] 40 CFR 264.112(c) and (c)(3), 264.118(d) and (d)(3), 265.112(c) and (c)(3), and 265.118(d) and (d)(3).

Owners or operators of both permitted and interim status facilities must revise their cost estimates to be consistent with the most recent plans but are not required to modify their permits or obtain prior approval from EPA.

3.4 CLOSURE SCHEDULE

The closure plan must contain a schedule of closure activities showing the total time required to close each hazardous waste management unit and the time required for intervening closure activities.[36] The regulations also establish procedures that an owner or operator must use to apply for variances or extensions of time if unusual circumstances or events make it impossible to meet the standard closure schedules. Both the activities that occur under a standard closure schedule and the deadlines that can be extended through a variance or extension are described in the subsections that follow. Appendix A illustrates graphically through the use of timelines the deadlines that apply to closure of the various types of hazardous waste management units.

3.4.1 Receipt of Final Volume of Hazardous Wastes

Closure must begin no later than 30 days after receipt of the final volume of hazardous wastes. However, if the owner or operator can show that there is a "reasonable possibility" that the unit will receive additional volumes of hazardous wastes, closure may be delayed until no later than one year after receipt of the most recent volume of hazardous wastes.[37] The Regional Administrator or State Director also may extend the deadline past one year on a case-by-case basis if the owner or operator can demonstrate to the Regional Administrator or State Director that:[38]

(1) **the hazardous waste management unit has the capacity to receive additional wastes** and

(2) the owner or operator has taken and will continue to take **steps to prevent threats to human health and the environment**, including compliance with all applicable regulations.

Among the factors that should be taken into account are the following:

- Unit or facility characteristics (e.g., capacity, operating conditions);
- Demand for the facility, including the presence or absence of potential disposers (e.g., contracts for disposal at the facility, operating plant with on-site disposal needs);

---

[36] 40 CFR 264.112(b)(6) and 265.112(b)(6).

[37] 40 CFR 264.112(d)(2) and 265.112(d)(2).

[38] 40 CFR 264.112(d)(2) and 265.112(d)(2).

- Owner's or operator's business plans (e.g., sales of necessary equipment, plans to cease business operation); and

- History of facility operations (e.g., compliance records, business cycles).

Exhibit 3-2 shows how some of these factors may help to determine whether the receipt of the final volume of hazardous wastes has occurred, or whether a "reasonable possibility" exists of receipt of additional hazardous wastes.

3.4.2 Notification of Closure

Exhibit 3-3 summarizes the deadlines for notifying the Regional or State Office of the intent to close a unit or facility.[39] An owner or operator of a permitted facility or an interim status facility with a previously approved closure plan, must notify the Regional Administrator or State Director of his intent to begin closure of a hazardous waste surface impoundment, waste pile, landfill, or land treatment unit, at least 60 days before closure is scheduled to begin. If final closure involves a disposal unit, 60-day notice is also required. No notification is required for partial closures involving only container storage, tank or incinerator units. Final closure involving only non-disposal units requires 45 days notice.

An owner or operator of an interim status facility without an approved plan must submit the closure and post-closure plans at least 180 days prior to closure of the first disposal unit closed after October 29, 1986, or final closure, whichever is earlier. If the facility has no disposal units to be closed after October 29, 1986, an owner or operator must submit the closure plan for approval at least 45 days prior to the beginning of FINAL closure. An owner or operator may remove hazardous wastes or decontaminate or dismantle equipment at any time before or after notification of partial or final closure.[40] For example, an owner or operator may remove liquids from an impoundment prior to notifying EPA of closure or, for interim status facilities, of submitting the plan for final approval.

No specific form is required for notification of closure. A sample notice format, including the minimum data requirements of 40 CFR 264.112(d) and 265.112(d), is provided in Exhibit 3-4.

3.4.3 Completion of Closure Activities

Owners or operators must treat, remove from the unit or facility, or dispose of on-site all hazardous wastes within 90 days after receiving the final volume of hazardous wastes in accordance with the approved closure

---

[39] 40 CFR 264.112(d)(1), 265.112(d)(1), and 265.118(e).

[40] 40 CFR 264.112(e) and 265.112(e).

EXHIBIT 3-2

RECEIPT OF FINAL VOLUME OF HAZARDOUS WASTES

FACTORS SUGGESTING RECEIPT OF FINAL VOLUME OF HAZARDOUS WASTES	FACTORS SUGGESTING "REASONABLE POSSIBILITY" OF RECEIPT OF ADDITIONAL HAZARDOUS WASTES
No additional capacity in unit or facility	Additional capacity available in unit or facility
Termination of contracts with generators	Contract or contract negotiations for continuation of disposal service
Sale by owner or operator of equipment, land, or other necessary factors for operation	Sale or potential sale of closed plant to another operator
Unit or facility will require extensive rebuilding or retrofitting before additional hazardous wastes could be received	Record of previous downtimes in certain months of year
On-site generator has terminated operations	On-site generator can show plan to reopen closed plant

EXHIBIT 3-3

NOTIFICATION REQUIREMENTS

FACILITY TYPE	NOTIFICATION DEADLINE
(1) Permitted Facilities and Interim Status Facilities With Previously Approved Plans	
(a) Partial Closures	
• Disposal Unit	60 days notice
• Nondisposal Unit (container storage, tank, or incinerator)	No notification required
(b) Final Closure	
• Disposal Unit	60 days notice
• Nondisposal Unit	45 days notice
(2) Interim Status Facilities Without Approved Plans	
(a) Partial Closures	
• Disposal Unit	180 days notice and submittal of closure and post-closure plans
• Nondisposal Unit	No notification required
(b) Final Closure	
• Disposal Unit	180 days notice and submittal of closure and post-closure plans
• Nondisposal Unit	45 days notice and submittal of closure plans

EXHIBIT 3-4

SAMPLE FORMAT FOR NOTIFICATION OF CLOSURE

Regional Administrator
US EPA, Region _____
City, State

I am the [owner or operator] of the following hazardous waste management facility [or facilities]:

[Insert name, address, and EPA identification number of each facility]

This letter provides notice, as required under 40 CFR 264.112(d) and 265.112(d), that I intend to begin closure of the [type of facility or unit, e.g., surface impoundment, waste pile, etc.] [facility or unit] on [date].

[signature of owner or operator]

[date]

plan or, for interim status facilities, within 90 days after approval of the closure plan, whichever is later.[41] Partial or final closure must be completed within 180 days after receipt of the final volume of hazardous wastes.[42] An owner or operator may be granted an extension to either of these deadlines if he submits a request to the Regional Administrator or State Director at least 30 days prior to the expiration of the 90- or 180-day periods. Alternatively, requests for extensions may be incorporated into the original closure plan (or subsequent modifications to the plan) or Part B application. In requesting an extension, the owner or operator must demonstrate that:[43]

> The partial and final closure activities will, of necessity, take longer than 90 or 180 days to complete, **or**
>
> The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes; **and**
>
> He or another person is likely to recommence operation of the hazardous waste management unit or facility within one year; **and**
>
> Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site;
>
> **AND**
>
> He is complying with all applicable permit requirements.

The following examples of facility conditions could warrant extensions to the closure deadlines:

- More time is required to complete land treatment. Closure does not typically, if ever, coincide with the cessation of all treatment processes, which often take several years to complete. During closure, the owner or operator must continue the waste degradation, transformation, or immobilization process until a final vegetation cover can be placed. Depending on site-specific processes or environments, the appropriate time period before establishing the vegetation cover could exceed 180 days; or
- More time is required for waste processing activities, such as evaporation or neutralization.

---

[41] 40 CFR 264.113(a) and 265.113(a).

[42] 40 CFR 264.113(b) and 265.113(b).

[43] 40 CFR 264.113(a)(1) and (2), 264.113(b)(1) and (2), 265.113(a)(1) and (2), and 265.113(b)(1) and (2).

The owner's or operator's operating log may be one of the best sources available to support the claim that an extension to the closure deadline is needed. The operating log must record the date of storage, treatment, and disposal of all wastes at the facility and thus would document the length of time required to complete routine treatment practices.

3.4.4 Submittal of Closure Certification

Certification of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit must be submitted within 60 days of completion of closure of each unit. Certification of container storage, tanks, and incinerator units must be submitted within 60 days of completion of FINAL closure. Although certification of the non-disposal units may be delayed until final closure or closure of the next disposal unit, the owner or operator must be able to demonstrate that closure was in accordance with the approved plan (see Section 2.2.10).

Certifications must be signed by the owner or operator and by an independent registered professional engineer. (The owner or operator and the independent registered professional engineer may either both sign the same certification, or submit separate documents.) Examples of closure certifications by the owner or operator and by the independent registered professional engineer are provided in Exhibits 3-5 and 3-6. Similar documents could be used for post-closure care certifications. Documentation supporting closure and post-closure care certifications (e.g., inspection reports, and quality assurance/quality control demonstrations) need not be submitted with the certifications, but must be retained by the owner or operator and be made available to the Regional Administrator or State Director upon request. Documentation must be retained until the owner or operator has been released from the financial assurance requirements.[44]

3.4.5 Submittal of Survey Plat

A survey plat must be submitted to the Regional Administrator or State Director and to the local zoning authority, or the authority with jurisdiction over local land use, for each land disposal unit no later than the submittal of the closure certification (i.e. within 60 days of completion of closure of each unit) (see Section 2.2.9).[45]

3.4.6 Submittal of Record of Wastes

No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner or operator must submit to the local zoning authority, or authority with jurisdiction over local land use, and to the Regional Administrator or State Director **a record of the type, location, and quantity of hazardous wastes within each unit.** For hazardous wastes that

---

[44] 40 CFR 264.115, 265.115, 264.120 and 265.120.

[45] 40 CFR 264.116 and 265.116.

EXHIBIT 3-5

SAMPLE OWNER OR OPERATOR CLOSURE CERTIFICATION

The undersigned, __________(Name of Owner or Operator)__________, a (1) Corporation, incorporated under the laws in the State of __________ and licensed to do business in __________, or (2) (Partnership, Individual, Municipality or Other Entity), with its principal place of business at __________(Address)__________, which formerly owned or operated a hazardous waste (Description of Hazardous Waste Activity) (hereinafter "Facility") known as ____(Name of Hazardous Waste Facility)____ and located at __________(Location)__________ in __________ County, ___(State)___, has completed and permanently ceased the active operation of the facility and has fully implemented all measures relating to the closure of the facility as set forth in the Closure Plan approved by ___(Region or State)___ for said facility.

NOW, THEREFORE, I(we) __________(Name of Owner/Operator)__________ hereby swear and affirm that the above-named hazardous waste facility has been closed in accordance with the facility's Closure Plan approved in writing by (name of Regional Administrator or State Director) on __________, 19__, that all measures relating to the closure of the facility required by the Closure Plan and the rules and regulations of (regulatory citation) have been fully implemented, and that to the best of my (our) knowledge, no violations continue to exist that may have arisen prior to closure.

____
(Signature)

____
(Title)

____
(Address)

Taken, sworn and subscribed before me, this
_____ day of ________________ A.D. 19__
____
____
(Notary)

EXHIBIT 3-6

SAMPLE INDEPENDENT REGISTERED PROFESSIONAL ENGINEER CLOSURE CERTIFICATION

I, ____________________ (Name) ____________________, a Professional Engineer registered pursuant to the Professional Engineers Registration Law, ______________, hereby certify that I have reviewed the Closure Plan for the __________ (Type of Facility) __________ at __________ (Name of Hazardous Waste Facility) __________ ("facility"), located at ____________________ (Location) ____________________ that I am familiar with the rules and regulations of (regulatory citation) pertaining to closure of such facility, and that I personally have made visual inspection(s) of the aforementioned facility, and that the closure of the aforementioned facility has been performed in full and complete accordance with the facility's closure plan approved in writing by (Regional Administrator or State Director) on ______________, 19__, and the rules and regulations of (regulatory citation).

______________________________ (Signature)

______________________________ (Date)

______________________________ (Professional Engineering License Number)

______________________________ (Business Address)

(Seal)

______________________________ (Telephone Number) were disposed of before January 12, 1981, the owner or operator must identify the type, location and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records that he has kept.[46]

3.4.7 Submittal of Deed Notation

Within 60 days of certification of closure of the FIRST and LAST hazardous waste disposal unit, the owner or operator must record a notation, in accordance with State law, on the deed to the facility property (or on some other instrument such as a restrictive covenant or easement which is normally examined during title search) that states that hazardous wastes have been disposed on the property and that property use is restricted under 40 CFR Subpart G regulations. The deed notice must also indicate that a survey plat and record of waste have been filed.[47] The owner or operator may also wish to notify any current holders of easements to ensure that they are aware of the restrictions on the property.

Each state has some form of recording statute that provides for the maintenance in each county of a permanent public record of land titles and other legal interests in land. The record is usually kept in an office at the county seat known as the County Recorder's Office, the County Clerk's Office, the Circuit Court Clerk's Office, the County Registrar's Office, or the Bureau of Land Records. The public record of title documents is different from the central file of property records maintained by most local land use authorities. Because title documents differ by locality, the form of the notice can be expected to vary from State to State and even within States. Exhibit 3-7 provides a sample deed notice. At a minimum, the notation on the title document should include:

- the owner's name and address;
- the address and legal description of the property;
- a reference to the use of the property as a hazardous waste disposal facility;
- the date the facility began to receive hazardous wastes;
- a reference to the Subpart G land use restrictions;
- the need for all future purchasers and lessees of the property to inform themselves concerning the requirements of the federal regulations and the types and locations of wastes on the property;

---

[46] 40 CFR 264.119(a) and 265.119(a).

[47] 40 CFR 264.119(b)(1) and 265.119(b)(1).

EXHIBIT 3-7

SAMPLE NOTICE IN DEED

TO WHOM IT MAY CONCERN:

I, ________________(owner or operator)____________________ the undersigned, of

____________________(street address)________________________, City of ______________________________, County of __________________________, State of ______________________________, hereby give the following notice as required by 40 CFR 264.119 or 265.119:

1. I am, and since ____________, 19__ have been in possession of the following described lands _____(legal description)______________

____

2. Since ____________, 19__, I have disposed of hazardous chemical wastes under the terms of regulations promulgated by the United States Environmental Protection Agency on/in the above-described land.

3. The future use of the above-described land is restricted under the terms of 40 CFR Subpart G: the post-closure use of the property must never be allowed to disturb the integrity of either the containment system or the facility's monitoring system, unless the Regional Administrator or State Director determines that the proposed use (1) will not increase the potential threat to human health or the environment, or (2) is necessary to reduce the threat to human health or the environment.

4. Any and all future purchasers of this land should inform themselves of the requirements of the regulations and ascertain the amount and nature of wastes disposed of on/in the above-described property.

5. I have filed a survey plat with the (name and address of local land authority) and with the Regional Administrator of EPA, Region # (or State Director, State of _________________), at (address of Regional Administrator or State Director) showing the location and dimensions of landfill cells and a record of the type, location and quantity of waste disposal within each area of the facility.

Signed:

(owner or operator) ____date____

(notary public) ____date____

- a reference to the survey plat and record of waste in the files of a (specifically named) local land use authority pursuant to §§264.119 and 265.119; and

- notarized signature of the owner or operator.

Local recording requirements also vary from jurisdiction to jurisdiction across the country. Some jurisdictions will allow re-recording of an amended instrument with a note on the first page that refers to the changes made. Other jurisdictions require that a wholly new deed be recorded if more than a mere correction is intended. To find out what the local requirements are for a recording notice on a deed, owners or operators should contact the local deed recorder, usually located in the city or county clerks office of the city or county where the property is located.

The owner or operator must submit to the Regional Administrator or State Director a certification signed by himself, stating that he has recorded the deed notation, and include a copy of the document in which the notation has been placed.[48] Exhibit 3-8 is an example of an owner's or operator's certification.

Under some limited circumstances, an owner or operator may wish to remove hazardous wastes from the disposal unit after closure. If he so chooses, he must request a modification to the post-closure permit in accordance with the applicable requirements in 40 CFR 124.5, 270.41, and 270.42. For facilities with interim status, the owner or operator must request a modification to the approved post-closure plan, in accordance with the provisions of §265.118(g).[49] In addition, he must demonstrate that the removal of hazardous wastes is necessary to the proposed use of the property and will not increase risks at the facility, or is necessary to reduce risks.[50] If the owner or operator is granted approval to remove all hazardous wastes, he may request that:[51]

- the notation on the deed indicating that the land has been used as a disposal facility be removed; or

- a notation to the deed or instrument indicating the removal of the hazardous waste be added to the notice.

3.4.8 Release from Financial Assurance

Within 60 days after the Regional Administrator or State Director receives certification of final closure of a facility and certification of the completion of the post-closure care period for each unit, the Regional Administrator or State Director will notify the owner or operator that either:

---

[48] 40 CFR 264.119(b)(2) and 265.119(b)(2).

[49] 40 CFR 265.119(c) and 265.119(c).

[50] 40 CFR 264.117(c) and 265.117(c).

[51] 40 CFR 264.119(c) and 265.119(c).

EXHIBIT 3-8

SAMPLE CERTIFICATION OF DEED NOTICE

I (owner or operator name) of the hazardous waste facility located at ________ (complete address) ________, certify that a notation on the deed to the facility has been recorded, as required by 40 CFR 264.119(b)(2) or 265.119(b)(2), at the ___ (town, city, or county) recorder of deeds, located at ________ (complete address) ________, on ___ (date of recording). A certified copy of the document in which the recorded notice has been placed is attached.

signed:

(owner or operator) date

(notary public) date

1) he is no longer required to maintain financial assurance for final closure or post-closure care, whichever is applicable, or

2) he is not being released from the financial responsibility requirements because closure or post-closure care has not been completed in accordance with the approved plans.

If the owner or operator is not being released from the financial responsibility requirements, he will receive a detailed written statement from the Regional Administrator or State Director which explains why he believes that closure or post-closure care has not been conducted in accordance with the approved closure or post-closure plan.[52]

3.5 PROCEDURES FOR ALTERING THE LENGTH OF THE POST-CLOSURE CARE PERIOD

The post-closure care period for each hazardous waste management unit begins immediately after completion of closure of the unit and continues for 30 years after that date.[53] **The post-closure care period may be extended or shortened at the discretion of the Regional Administrator or State Director**, based on whether an extended period is necessary, or a reduced period is sufficient, to protect human health and the environment. Section 2.3.2 and Appendix B discuss factors that may deserve consideration in evaluating the length of the post-closure care period. The post-closure care period for a hazardous waste management unit can be lengthened or shortened:[54]

- at any time preceding closure of the hazardous waste disposal unit;
- at any time preceding final closure; or
- at any time during the post-closure period for the hazardous waste disposal unit.

---

[52] 40 CFR 264.143(i), 264.145(i), 265.143(h), and 265.145(h).

[53] 40 CFR 264.117(a)(1) and 265.117(a)(1).

[54] 40 CFR 264.117(a)(2) and 265.117(a)(2).

CHAPTER 4

INSTRUCTIONS FOR PREPARING CLOSURE AND POST-CLOSURE COST ESTIMATES

Owners and operators must prepare **detailed written estimates of the current costs of closing their facilities and, for disposal facilities, the costs of monitoring and maintaining them after closure.**[1] **The cost estimates must be based on the activities described in the closure and post-closure plans.** These cost estimates are used to determine the level of financial assurance required.

This chapter discusses the assumptions to be used in developing estimates as follows:

- Section 4.1 -- Applicability of cost estimating requirements;
- Section 4.2 -- Basic rules for preparing cost estimates;
- Section 4.3 -- Revising cost estimates to reflect changes in closure and post-closure plans;
- Section 4.4 -- Annual adjustments for inflation; and
- Section 4.5 -- Documentation for cost estimates.

This chapter supplements the information included in Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H) (hereinafter referred to as Cost Estimate Guidance Manual), EPA #530-SW-86-036, OSWER Policy Directive Number 9476.00-6. That document includes sample worksheets outlining the cost components that should be included in a closure or post-closure cost estimate for various process types. In addition, that document presents unit costs (or ranges of costs) for each of the activities.

4.1 APPLICABILITY OF COST ESTIMATING REQUIREMENTS

Exhibit 4-1 summarizes the applicability of the cost estimating regulations as follows:

(1) Owners or operators of **ALL TSDFs** with the exception of Federal or State government agencies, **must prepare closure cost estimates based on the closure plans.**[2]

---

[1] 40 CFR 264.142(a), 264.144(a), 265.142(a), and 265.144(a).

[2] 40 CFR 264.140 and 265.140.

EXHIBIT 4-1

APPLICABILITY OF CLOSURE AND POST-CLOSURE COST ESTIMATES

Process Type	Closure Cost Estimate	Contingent Closure Cost Estimate	Post-Closure Cost Estimate
Permitted Facilities			
Container	X		
Tank with secondary containment	X		Required only if it is determined prior to certification of final closure that the unit must be closed as a landfill.
Tank without secondary containment	X*	X*	X
Incinerator	X		
Landfill	X		X
Land treatment	X		X
Disposal surface impoundment	X		X
Storage or treatment surface impoundment: satisfies liner design standards	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.
Storage or treatment surface impoundment: does not satisfy liner design standards		X	X
Waste pile: satisfies liner design standards	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.
Waste pile: does not satisfy liner design standards		X	X
Interim Status Facilities			
Container	X		
Tank with secondary containment	X		Required only if it is determined prior to certification of final closure that the unit must be closed as a landfill
Tank without secondary containment	X*	X*	X
Incinerator	X		
Landfill	X		X
Land treatment	X		X
Disposal surface impoundment	X		X
Storage or treatment surface impoundment	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.
Waste pile	X		Required only if it is determined prior to the certification of closure that the unit must be closed as a landfill.

---

* These units require one cost estimate based on the most expensive method of closure.

(2) **Owners or operators of ALL facilities with disposal units must prepare estimates of the costs of conducting 30 years of post-closure care based on the post-closure plan.** Disposal units include landfills, land treatment, and disposal surface impoundments.

(3) **ALL owners or operators of surface impoundments, waste piles, and tanks required to prepare contingent closure and post-closure plans must prepare closure and post-closure cost estimates consistent with the contingent plans.**[3] Owners or operators of tanks must prepare a closure cost estimate consistent with the contingent closure plan if those costs are higher than the costs of "clean closure".[4] (See Section 2.1.3 of this manual for further discussion on contingent plans.)

(4) **Owners or operators of ALL storage or treatment surface impoundments, waste piles, or tanks not otherwise required to prepare contingent plans and cost estimates must revise the closure cost estimate and prepare a post-closure cost estimate if it is determined prior to the certification of final closure that the unit must be closed as a landfill.**[5]

4.2 BASIC RULES FOR PREPARING COST ESTIMATES

The following sections describe the assumptions that should be used when preparing closure and post-closure cost estimates:

- Section 4.2.1 -- Relationship between the closure and post-closure plans and cost estimates;
- Section 4.2.2 -- Scope of the closure cost estimate;
- Section 4.2.3 -- Scope of the post-closure cost estimate;
- Section 4.2.4 -- Inclusion of ground-water monitoring costs in cost estimates;

---

[3] 40 CFR 264.228(c) and 264.258(c).

[4] 40 CFR 264.197(c) and 265.197(c).

[5] 40 CFR 264.112(c), 264.118(a) and (c), 264.197(b), 265.112(c), 265.118(a) and (d), and 265.197(b).

- Section 4.2.5 -- First- vs. third-party costs; and
- Section 4.2.6 -- Disallowance of salvage value and zero credit for sale of hazardous wastes.

4.2.1 Relationship Between the Closure and Post-Closure Plans and Cost Estimates

The closure and post-closure cost estimates must be based on activities described in the closure and post-closure plans (or contingent plans). Exhibit 4-2 lists the key activities that must be included in the closure and post-closure cost estimates. **Closure and post-closure cost estimates must include a cost for each activity or sub-activity outlined in the closure and post-closure plans.** The cost components included in the cost estimate should correspond to the activities described in the plan.

The cost estimates may be prepared on a per-unit basis or for the whole facility. Appendix C of this manual includes sample closure and post-closure plan checklists prepared on a per-unit basis that may be useful in identifying cost components to include in the cost estimates. The Cost Estimate Guidance Manual also presents costs on a per-unit basis. Owners or operators of facilities with multiple units may prefer to estimate certain costs (e.g., final cover installation, incineration of inventory, removal of wastes from an impoundment) on a per-unit basis and others on a facility-wide basis (e.g., ground-water monitoring, testing for soil contamination, removal of contaminated soil and residues, decontamination of facility equipment and structures, and certification of final closure).

4.2.2 Scope of the Closure Cost Estimate

The closure cost estimate should reflect the costs of conducting closure in the year that the estimate is prepared. Annually thereafter, the owner or operator must **update this estimate for inflation** either by using an inflation adjustment factor, **or by recalculating the cost estimate** based on current costs of that year (see Section 4.4).

The closure cost estimate must be based on the most expensive cost of closure at any time over the life of the facility.[6] The closure cost estimate should always be high enough to ensure that if, at any time, the facility had to begin closure, the costs of closure would not exceed the cost estimate. For example, the cost estimate must account for the costs of managing the maximum inventory over the life of the facility, including the costs of constructing a new cell to handle the wastes, if necessary, if the wastes are to be disposed on-site, and closing the maximum number of cells of a landfill even open, including those no longer receiving wastes but not yet completely closed. The conditions on which the cost estimate is predicated may differ significantly from the conditions anticipated at the end of normal facility life.

---

[6] 40 CFR 264.142(a)(1) and 265.142(a)(1).

EXHIBIT 4-2

KEY ACTIVITIES TO BE INCLUDED IN THE CLOSURE AND POST-CLOSURE COST ESTIMATES

ACTIVITIES	
CLOSURE	POST-CLOSURE CARE
Inventory management - transportation to off-site TSDF - on-site treatment or disposal	Monitoring
Facility decontamination	Leachate management
Monitoring activities	Routine maintenance
Final cover installation	Filing post-closure notices
Maintenance of security	Maintenance of security
Survey plat	Post-closure certification
Closure certification	

In some cases, owners or operators may intend to expand the capacity or capabilities of the facilities by constructing new hazardous waste management units or expanding existing ones. **The cost estimate must equal the maximum costs of closing all units currently active at the facility.** If an owner or operator does not close units prior to expanding or constructing new ones, the maximum extent of operation over the life of the facility will be significantly greater than at the time the cost estimate was first prepared and subsequently updated. Owners and operators must revise their cost estimates whenever the cost of closing the units currently active at the facility increases. **When new units are constructed or existing units are expanded, the cost estimate must be increased within 60 days prior to the initial receipt of hazardous waste at the new (or expanded) unit.**

The cost estimate need not include the costs of responding to highly unusual contingencies unless such circumstances apply at the time the owner or operator prepares the initial cost estimate. For example, the cost estimate need not account for costs resulting from the effects of the 100-year flood or a liner failure that requires all hazardous wastes in a trench to be dug up and disposed elsewhere. If such an event occurs during the life of the unit or facility, thus causing the original maximum inventory estimate to be exceeded, the owner or operator should revise the closure plan and cost estimate to account for the new conditions, unless the maximum inventory will be reduced to the level originally estimated quickly.

To account for the maximum costs of closure, the cost estimate should reflect fully loaded costs, including cost of labor, fuel and maintenance, contingency fees which are routinely incorporated into contractor cost estimates. Finally, the closure cost estimates must be based on the costs of hiring an independent party to conduct closure (see Section 4.2.5).

4.2.3 Scope of the Post-Closure Cost Estimate

The post-closure cost estimate must reflect the costs of monitoring and maintaining each disposal unit of the facility for the entire post-closure care period.[7] When preparing the cost estimate, the owner or operator should assume a 30-year post-closure care period unless the Regional Administrator or State Director extends or reduces the length of the period prior to final closure of the facility. Because the timing of the post-closure care period may vary by unit (i.e., some units will be closed while others will be operating) at some facilities it may be easiest to calculate post-closure care costs on a per-unit basis.

The post-closure cost estimate for each unit is calculated by multiplying the current ANNUAL post-closure cost estimate by the number of years of

---

[7] 40 CFR 264.144(a) and 265.144(a).

post-closure care required.[8] The estimate must include the cost of activities conducted annually over the post-closure care period (e.g., ground-water monitoring and inspections), and activities required less frequently, such as: extensive soil replacement and maintenance or replacement of equipment (e.g., ground-water monitoring wells).

The post-closure cost estimate should reflect the costs of 30 years of post-closure care in the year that the estimate is prepared and should be adjusted annually thereafter until final closure has been certified (see Section 4.4). The post-closure cost estimate should also incorporate fully loaded costs and third-party costs (see Section 4.2.5).

4.2.4 Inclusion of Ground-Water Monitoring Costs in Cost Estimates

The cost estimate for ground-water monitoring during the closure and post-closure care periods, should be consistent with the costs of monitoring activities conducted during the operating life. If a corrective action program has been instituted at a unit or facility, the costs of conducting corrective action do not need to be included in the cost estimates.[9] The costs of compliance monitoring, however, must be included.

4.2.5 First- vs. Third-Party Costs

The regulations specify that the **closure and post-closure cost estimates must be based on the costs to the owner or operator of hiring a THIRD PARTY to conduct the activities specified in the closure and post-closure plans.**[10] Parents or subsidiaries of the owner or operator cannot be considered third parties.[11] The regulations do not require that the estimates be prepared by a third party.

---

[8] 40 CFR 264.144(a)(2) and 265.144(a)(2).

[9] Regulations requiring financial assurance for corrective action are currently being developed under the authority of RCRA Sections 3004(a) and (u). Financial assurance for corrective action was proposed on October 24, 1986 in 51 Federal Register 37854.

[10] 40 CFR 264.142(a)(2), 264.144(a)(1), 265.142(a)(2), and 265.144(a)(1).

[11] 40 CFR 264.142(a)(2), 264.144(a)(1), 265.142(a)(2), and 265.144(a)(1). A parent is a corporation that directly owns 50 percent or more of the voting stock of the corporation that owns or operates the facility. A corporation is considered a subsidiary of the owner or operator if 50 percent or more of its stock is owned by the owner or operator (40 CFR 264.141(d) and 265.141(d)).

The following assumptions should be used when preparing the estimates:

- **Hazardous wastes may be treated or disposed of on site or at an off-site TSDF.** However, if an owner or operator chooses on-site management, he must demonstrate that on-site capabilities will be available at all times over the life of the facility. For example, if an owner or operator intends to dispose of wastes in tanks by deep welling them on site, the plan must indicate that the underground injection wells will be open and operating and are allowed to accept the wastes from the tank. In addition, if the owner or operator intends to dispose of wastes on site, he must demonstrate that disposal capacity will be available at all times over the life of the facility. **(If the owner or operator intends to dig a trench or cell at closure to handle remaining inventory, the costs of cell design and construction must be included in the cost estimate.)**

- **The estimate of costs of managing hazardous wastes on site must be sufficient to cover routine maintenance** that may be required at any time over the life of the facility (e.g., operating and maintenance costs for incinerators).

- **The cost estimates must incorporate the costs of a third party conducting all closure and post-closure care activities** including managing hazardous wastes on site, if applicable. For example, the estimate must include the costs of hiring a third party to pretreat wastes and dispose of them on site.

Although the estimates must be based on the costs of a third party conducting all closure and post-closure care activities, the owner or operator or a corporate parent or subsidiary may conduct the activities specified in the closure and post-closure plans. Under all circumstances, however, closure and post-closure care certifications must be completed by an INDEPENDENT registered professional engineer.[12]

4.2.6 Disallowance of Salvage Value and Zero Credit for Sale of Hazardous Wastes

An owner or operator may intend to recycle all remaining hazardous wastes or sell equipment, land, or hazardous waste. While these practices are encouraged, **an owner or operator may not deduct the potential salvage value of these items from the closure cost estimate.**[13] **Similarly, owners or operators may not assign a zero value to the costs of disposing of wastes** that are expected to have economic value at closure.[14]

---

[12] 40 CFR 264.115, 264.120, 265.115 and 265.120.

[13] 40 CFR 264.142(a)(3) and 265.142(a)(3).

[14] 40 CFR 264.142(a)(4) and 265.142(a)(4).

4.3 REVISING COST ESTIMATES TO REFLECT CHANGES IN CLOSURE AND POST-CLOSURE PLANS

Prior to certification of final closure of the facility, owners or operators must revise the closure and post-closure cost estimate whenever a change in the closure or post-closure plan INCREASES the cost estimate.[15] (See Section 3.3 of this manual for a discussion of deadlines and procedures for revising the plans and estimates.) If the Regional or State Office determines prior to final closure that post-closure care for any or all of the units must continue for longer than 30 years, the owner or operator must increase the post-closure cost estimate accordingly. If an owner or operator of a storage or treatment impoundment, waste pile, or tank system not otherwise required to prepare a post-closure cost estimate must close the unit as a landfill, the owner or operator must prepare a post-closure cost estimate. An owner or operator may revise the cost estimates if a change in the plans results in a decrease in the costs.

4.3.1 Changes in the Closure or Post-Closure Plans that May Increase the Cost Estimates

The following changes in facility conditions or activities could increase the closure or post-closure cost estimate:

- An increase in facility size and/or capacity;
- Changes in the partial closure schedule (e.g., an owner or operator conducts partial closures of the facility less frequently than originally scheduled, thus increasing the maximum extent of the operation);
- An increase in the estimate of maximum inventory;
- Changes in the types of hazardous wastes to be handled at closure;
- Changes in regulatory requirements that affect the costs of closure activities (e.g., pretreatment standards that must be satisfied to landfill certain hazardous wastes;

---

[15] 40 CFR 264.142(c), 264.144(c), 265.142(c), and 265.144(c).

- More extensive ground-water monitoring requirements as a result of an owner's or operator's operating experience or the availability of new data that were previously unavailable;

- Contingencies over the operating life of the facility which affect the types of activities that will be required at closure or during the post-closure care period;

- For surface impoundments, wastes piles, and tanks not otherwise subject to the contingent plan and cost estimate requirements, extensive soil contamination results in the need to close the unit as a landfill and conduct post-closure care;

- Extensions to the length of the post-closure care period for one or more units;

- Changes in annual or intermittent post-closure care maintenance activities, including changes in the nature and frequency of the activities required; and

- Changes in surrounding land use (e.g., an increase in population density surrounding the facility warrants increased security provisions during the post-closure care period; expanded ground-water monitoring is required due to a change in the underlying ground-water usage).

4.3.2 Changes in the Closure or Post-Closure Plans that May Decrease the Cost Estimates

The closure cost estimate may be reduced ONLY if the new estimate still accounts for the maximum costs of closing operating units at any time over the life of the facility. The following changes in facility conditions may justify a decrease in the closure or post-closure cost estimate:

- Reductions in the size of the facility remaining to be closed over the remaining life of the facility (e.g., if the maximum cost of closure over the life of the facility includes the costs of closing two landfill cells and four tanks, the cost estimate may be reduced after closure of the entire landfill if only the storage tanks were operating for the remaining life of the facility);

- Reduction in the size of the facility subject to post-closure care (e.g., fewer cells of a landfill are operated than were originally intended);

- Changes in manufacturing processes reduce the quantities of hazardous wastes to be handled at closure;

- Reduction in the number of years of post-closure care remaining for units closed prior to final closure of the facility.

4.4 ANNUAL ADJUSTMENTS FOR INFLATION

The closure and post-closure cost estimates must equal the current costs of closing the facility and conducting 30 years of post-closure care. To account for annual inflation, an owner or operator may either: (1) recalculate estimates every year using that year's current prices; or (2) every year multiply the current estimate by an inflation factor that measures the general trend in prices in the economy.[16] The cost estimates must be updated until final closure of the facility.

4.4.1 Options for Updating the Closure and Post-Closure Cost Estimates for Inflation

Owners or operators may choose to update their cost estimates for inflation by recalculating the costs using current dollars. For example, if the owner or operator prepared the initial cost estimates in 1985 using the prevailing prices in 1985, in 1986 he may recalculate the estimates using the prices prevailing in 1986.

If the owner or operator chooses to update the cost estimates annually using an inflation factor, **this factor must be derived from the most recent Annual Implicit Price Deflator for Gross National Product (GNP) and the Annual Implicit Price Deflator of the previous year.**[17] The implicit price deflator is an index that reflects the increase or decrease in the general price level over the past year, using prices from the year 1982 as the base.

Owners or operators using the implicit price deflator to adjust their cost estimates for inflation should follow these three steps:

Step 1. Obtain the most recent annual Implicit Price Deflator and the annual Implicit Price Deflator of the previous year.

Step 2. Calculate the inflation factor.

Step 3. Multiply the inflation factor by the cost estimate to derive the new cost estimate.

---

[16] 40 CFR 264.142(b), 264.144(b), 265.142(b), and 265.144(b).

[17] 40 CFR 264.142(b), 264.144(b), 265.142(b), and 265.144(b).

STEP 1. Obtain the MOST RECENT Annual Implicit Price Deflator and the Annual Deflator for the previous year from the following sources:[18]

(1) The Survey of Current Business;

(2) Economic Indicators;

(3) Regional or State EPA Office; and

(4) RCRA/Superfund Hotline.

(1) The **Survey of Current Business**, is published monthly by the U.S. Department of Commerce, Bureau of Economic Analysis. The figures for the Annual Implicit Price Deflators are included in the section of the Survey of Current Business called "National Income and Product Accounts Tables." The deflators are generally found in Table 7.1, entitled "Implicit Price Deflators for Gross National Product." Exhibit 4-3 includes a sample page from the November 1985 issue. The Implicit Price Deflator that is used to adjust the cost estimate is the one specified for Gross National Product (GNP) -- line 1 in Table 7.1 (see line 1 on Exhibit 4-3). The most recent annual deflator and the annual deflator of the previous year must be used. Therefore, the owner or operator should refer only to the annual totals for GNP and ignore all quarterly data. The most recent annual deflator in this issue is for 1984 -- 223.43; the deflator for the previous year (1983) is 215.34. (See "A" on Exhibit 4-3.)

Subscriptions of Survey of Current Business may be obtained for $30.00 per year by contacting the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. It also should be available in most large public libraries. If the publication is not available in the owner's or operator's library, the owner or operator may wish to urge the library to obtain the document from a Federal Depository Library. The Federal Depository Library Program provides government publications free of charge to designated libraries. Because of lag times in publishing and distribution, if the current month's issue is not available, the owner or operator should use the annual price deflators from the most recent issue available.

---

[18] Because the Department of Commerce derives the Annual Implicit Price Deflator by averaging prices throughout the calendar year, the Annual Implicit Price Deflator is generally not available until February of the following calendar year. Therefore, the most recent Annual Implicit Price Deflator will reflect inflation of the previous calendar year. For example, cost estimates adjusted for inflation in April 1987 will be updated using the Annual Implicit Price Deflator for 1986.

EXHIBIT 4-3

November 1985

SURVEY OF CURRENT BUSINESS

Table 3.2.—Federal Government Receipts and Expenditures

	Billions of dollars							
			Seasonally adjusted at annual rates					
	1983	1984	1984			1985		
			II	III	IV	I	II	III *
Receipts	641.1	704.7	704.2	706.2	721.9	771.4	733.9	772.0
Personal tax and nontax receipts	295.2	315.0	310.7	319.7	327.9	362.2	318.3	354.8
Income taxes	288.8	308.4	303.8	314.0	321.2	355.4	310.8	347.4
Estate and gift taxes	5.9	5.9	6.2	5.0	6.0	6.2	6.7	6.6
Nontaxes	.5	.7	.6	.7	.7	.7	.7	.7
Corporate profits tax accruals	59.8	70.8	73.6	65.3	69.1	67.4	66.1	69.5
Indirect business tax and nontax accruals	52.4	55.5	55.9	56.1	55.9	56.4	60.7	56.6
Excise taxes	36.1	35.8	36.1	35.6	35.5	35.3	35.3	35.3
Customs duties	9.1	11.9	12.1	12.4	12.1	12.5	11.5	12.0
Nontaxes	7.1	7.8	7.7	8.2	8.4	8.7	13.8	9.3
Contributions for social insurance	233.7	263.4	262.0	265.2	269.0	285.3	288.9	292.1
Expenditures	819.7	880.5	865.9	886.8	919.7	938.5	948.0	973.0
Purchases of goods and services	269.7	295.4	296.4	302.0	315.7	319.9	324.2	350.6
National defense	200.5	221.5	220.8	220.3	231.6	233.9	241.1	255.0
Nondefense	69.3	73.9	75.6	81.7	84.1	85.9	83.2	95.6
Transfer payments	345.6	353.0	350.1	353.8	360.4	370.3	369.8	373.0
To persons	338.7	344.5	343.7	346.2	347.2	363.1	361.6	365.6
To foreigners	7.0	8.4	6.4	7.7	13.1	7.2	8.2	7.4
Grants-in-aid to State and local governments	86.3	93.2	93.2	92.1	97.0	95.1	98.1	101.4
Net interest paid	94.2	116.7	110.9	122.0	126.4	128.2	132.8	132.2
Interest paid	119.5	143.6	138.0	149.0	153.9	155.6	159.6	160.0
To persons and business	101.8	124.0	119.2	128.9	132.9	134.9	139.0	139.1
To foreigners	17.7	19.6	18.9	20.0	21.0	20.7	20.6	20.9
Less: Interest received	25.3	26.9	27.2	27.0	27.4	27.4	26.9	27.8
Subsidies less current surplus of government enterprises	23.4	22.3	17.7	16.5	20.7	23.1	22.1	15.8
Subsidies	21.7	21.6	16.4	15.8	20.5	23.7	25.7	17.0
Less: Current surplus of government enterprises	−1.7	−.7	−1.3	−.7	−.2	.6	3.6	1.2
Less: Wage accruals less disbursements	−.4	.1	.2	−.4	.5	.1	−1.0	.0
Surplus or deficit (−), NIPA's	−178.6	−175.8	−163.7	−180.6	−197.8	−166.1	−214.1	−201.0
Social insurance funds	−28.4	−8.5	−7.7	−7.3	−10.2	−2.5	1.8	−.4
Other	−150.2	−167.4	−156.0	−173.3	−187.7	−162.6	−215.8	−200.6

Table 3.3.—State and Local Government Receipts and Expenditures

	1983	1984	1984 II	1984 III	1984 IV	1985 I	1985 II	1985 III *
Receipts	478.2	522.6	520.6	524.6	529.7	546.6	558.0	570.7
Personal tax and nontax receipts	109.0	120.3	119.6	121.2	123.8	126.8	129.9	131.9
Income taxes	58.7	64.5	64.5	64.6	65.7	67.2	68.7	68.9
Nontaxes	40.8	45.8	45.2	46.5	47.8	49.1	50.6	52.2
Other	9.5	10.0	9.9	10.2	10.3	10.5	10.7	10.9
Corporate profits tax accruals	16.0	19.1	20.2	17.8	18.5	17.9	17.8	18.6
Indirect business tax and nontax accruals	228.0	248.4	245.4	250.5	256.6	261.1	266.8	272.3
Sales taxes	107.4	119.4	118.3	120.2	123.0	125.0	127.9	131.0
Property taxes	91.3	98.3	96.9	99.4	101.9	103.9	106.0	107.9
Other	29.3	30.7	30.2	30.9	31.7	32.2	32.9	33.4
Contributions for social insurance	39.0	42.6	42.1	43.0	43.8	44.7	45.7	46.5
Federal grants-in-aid	86.3	93.2	93.2	92.1	97.0	95.1	98.1	101.4
Expenditures	434.1	470.7	466.1	477.0	484.0	491.9	507.7	521.1
Purchases of goods and services	415.8	452.0	447.4	458.9	464.8	472.0	486.7	498.8
Compensation of employees	241.4	260.7	258.3	263.0	267.8	273.3	278.3	283.3
Other	174.4	191.3	189.1	195.9	197.0	198.7	208.3	215.5
Transfer payments to persons	50.7	54.6	54.4	54.8	56.6	57.6	58.9	60.3
Net interest paid	−21.9	−25.3	−24.9	−25.9	−28.4	−26.4	−26.5	−28.4
Interest paid	32.4	38.2	37.5	39.0	40.6	42.2	43.8	45.4
Less: Interest received	54.3	63.5	62.4	64.9	68.9	68.6	70.2	71.9
Less: Dividends received	2.8	2.8	2.7	2.8	2.9	3.0	3.1	3.2
Subsidies less current surplus of government enterprises	−7.8	−8.1	−8.0	−8.1	−8.2	−8.2	−8.3	−8.4
Subsidies	.5	.6	.6	.6	.6	.7	.7	.7
Less: Current surplus of government enterprises	8.3	8.7	8.6	8.7	8.8	8.9	9.0	9.1
Less: Wage accruals less disbursements	0	0	0	0	0	0	0	0
Surplus or deficit (−), NIPA's	44.1	52.9	54.5	47.6	55.8	52.7	50.3	49.6
Social insurance funds	37.5	42.5	41.9	43.3	44.5	45.4	46.1	46.6
Other	6.6	10.4	12.6	4.3	11.1	3.3	4.2	3.0

Table 7.1.—Implicit Price Deflators for Gross National Product

Line one

A

	Index numbers, 1972 = 100							
			Seasonally adjusted					
	1983	1984	1984			1985		
			II	III	IV	I	II	III *
Gross national product	215.34	223.43	222.48	224.57	226.10	229.07	230.55	231.86
Personal consumption expenditures	213.6	220.4	219.2	221.5	222.8	224.6	226.2	227.4
Durable goods	177.7	179.0	179.5	179.2	178.4	179.1	178.4	178.1
Nondurable goods	213.0	217.7	216.4	217.8	219.4	220.1	221.2	221.7
Services	226.0	237.6	236.0	239.7	242.0	245.2	248.1	251.2
Gross private domestic investment								
Fixed investment	216.0	218.7	218.6	219.2	220.1	222.1	222.4	225.0
Nonresidential	206.4	207.8	207.4	208.0	209.4	211.3	212.1	214.8
Structures	263.7	264.5	264.1	265.2	265.9	268.1	271.0	274.7
Producers' durable equipment	183.3	186.0	185.4	186.5	187.6	189.2	189.1	191.3
Residential	246.4	255.7	255.9	258.6	259.1	258.6	259.3	260.5
Nonfarm structures	249.4	259.0	259.2	262.1	262.7	262.2	262.9	264.2
Farm structures	247.3	261.5	261.7	261.1	266.5	271.8	274.2	276.0
Producers' durable equipment	172.6	173.2	173.6	172.3	172.9	172.6	171.5	170.5
Change in business inventories								
Net exports of goods and services								
Exports	241.0	249.4	250.4	250.1	249.6	251.0	252.0	251.4
Imports	271.5	266.0	269.6	263.3	263.7	252.8	257.1	255.6
Government purchases of goods and services	234.9	247.4	246.2	248.6	251.4	254.8	258.6	259.4
Federal	232.1	241.2	240.6	241.5	243.7	246.4	250.1	248.2
National defense	236.6	247.2	246.4	247.4	249.8	252.4	255.6	255.4
Nondefense	220.0	224.7	225.1	227.1	228.2	231.5	235.2	230.9
State and local	236.7	251.7	250.0	253.5	256.9	260.9	264.7	267.9

Table 7.2.—Fixed-Weighted Price Indexes for Gross National Product, 1972 Weights

	Index numbers, 1972 = 100							
			Seasonally adjusted					
	1983	1984	1984			1985		
			II	III	IV	I	II	III *
Gross national product	223.8	233.4	232.8	236.1	237.2	239.7	242.1	242.9
Personal consumption expenditures	222.4	231.1	230.0	232.2	234.5	236.4	238.8	240.3
Durable goods	185.0	188.9	188.8	189.1	189.8	191.1	191.2	191.1
Nondurable goods	223.2	229.7	228.8	229.6	231.7	232.4	234.5	234.8
Services	234.3	246.9	246.2	249.4	252.3	255.5	258.9	252.2
Gross private domestic investment								
Fixed investment	234.5	240.6	242.2	244.0	244.9	245.6	247.0	248.8
Nonresidential	230.4	234.9	234.7	236.1	237.1	238.7	240.4	242.5
Structures	249.8	255.4	255.3	256.2	257.6	259.9	262.6	265.5
Producers' durable equipment	219.3	223.0	222.8	224.5	225.4	226.5	227.7	229.3
Residential	242.3	251.7	256.4	259.0	259.7	258.7	259.6	260.7
Change in business inventories								
Net exports of goods and services								
Exports	248.0	254.8	257.2	256.3	256.3	255.4	255.8	254.9
Imports	299.9	299.0	302.1	299.3	297.0	292.2	291.7	289.7
Government purchases of goods and services	238.5	249.2	248.2	250.6	252.9	257.2	259.9	262.4
Federal	236.7	246.5	246.4	247.3	247.9	252.8	253.5	254.7
National defense	242.3	252.6	252.9	253.4	253.8	258.5	259.5	260.8
Nondefense	222.3	230.7	230.0	231.6	232.7	238.2	238.2	239.2
State and local	238.4	251.0	249.4	252.8	256.2	260.1	264.1	267.6
Addenda:								
Gross domestic purchases [1]	227.2	236.3	235.7	237.9	239.9	242.1	244.4	246.2
Final sales	223.8	233.5	232.9	235.2	237.3	239.9	242.3	244.1
Final sales to domestic purchasers [1]	227.3	236.4	235.8	238.0	240.1	242.3	244.6	246.4
Personal consumption expenditures, food	221.8	230.9	229.5	230.9	232.7	234.2	233.9	234.3
Personal consumption expenditures, energy	365.0	368.3	369.1	367.9	369.4	365.2	376.0	372.9
Other personal consumption expenditures	209.4	218.5	217.3	220.1	222.5	225.1	227.5	229.8
Gross domestic product	224.3	233.9	233.0	235.3	237.4	240.0	242.4	244.2
Business	223.5	232.4	231.6	233.9	236.0	238.1	240.3	241.9
Nonfarm	224.6							

Table 7.1-7.2

1. Gross domestic purchases equals GNP less exports plus imports; final sales to domestic purchasers equals final sales less exports plus imports.

(2) **Economic Indicators** is published monthly by the Council of Economic Advisors. The same GNP annual deflators as are published in the Survey of Current Business are published on page 2 of Economic Indicators in a table entitled "Implicit Price Deflators for Gross National Product." Exhibit 4-4 includes a sample page from the November 1985 issue. As discussed above, the owner or operator should refer to the most recent annual figure for GNP and the annual figure for the previous year. (See "B" on Exhibit 4-4.)

Subscriptions may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $27.00 per year. It also should be available in most large public libraries or through the Federal Depository Library Program.

(3) The **EPA Regional or State Office** should maintain a subscription to Survey of Current Business or Economic Indicators.

(4) The owner or operator may also contact the **RCRA/Superfund Hotline** toll free from 8:30 to 4:30 EST at 800-424-9346. In Washington, D.C., the number is 202-382-3000. The owner or operator should be sure to request the most recent Annual Implicit Price Deflator and the final Annual Implicit Price Deflator for the previous year.

STEP 2. Calculate the inflation factor by dividing the most recent annual implicit price deflator by the annual implicit price deflator of the previous year. Using the figures included in the November 1985 issue of Survey of Current Business or Economic Indicators (shown in Exhibits 4-3 and 4-4) as an example, the inflation factor would be calculated as follows:

$$\frac{\text{Most recent GNP Annual Implicit Price Deflator, 1984}}{\text{Previous Year's Annual GNP Implicit Price Deflator, 1983}} = \frac{(223.43)}{(215.34)}$$

The result is an inflation factor of 1.04.

STEP 3. Adjust the cost estimates for inflation by multiplying the most recent closure and post-closure cost estimates by the inflation factor. For example, if a closure cost estimate of $100,000 prepared in December 1984 were adjusted for inflation in December 1985, the new cost estimate would be $104,000 (i.e., $100,000 times the inflation factor of 1.04). Each subsequent update for inflation will adjust the cost estimates updated the previous year. Using the above example, in December 1986, the owner or operator will multiply the new cost estimate of $104,000 by an inflation factor derived from the 1985 and 1984 Deflators.

4.4.2 Deadlines for Adjusting Cost Estimates for Inflation

Owners and operators must update their closure and post-closure cost estimates **within 60 days PRIOR to the anniversary date of the establishment of the financial assurance instrument.** Owners or operators who use the **financial test** to demonstrate financial assurance must update their cost

EXHIBIT 4-4

GROSS NATIONAL PRODUCT IN 1972 DOLLARS

[Billions of 1972 dollars; quarterly data at seasonally adjusted annual rates]

Period	Gross national product	Personal consumption expenditures	Gross private domestic investment			Exports of goods and services			Government purchases of goods and services					Final sales
			Nonresidential fixed	Residential fixed	Change in business inventories	Net exports	Exports	Imports	Total	Federal			State and local	
										Total	National defense	Non-defense		
1976	1,298.2	823.1	125.6	51.2	7.8	25.4	110.1	84.7	265.2	96.8	64.9	31.8	168.4	1,290.4
1977	1,369.7	864.3	140.3	60.7	13.3	22.0	112.9	90.9	269.2	100.4	65.4	35.0	168.8	1,356.4
1978	1,438.6	903.2	158.3	62.4	16.0	24.0	126.7	102.7	274.6	100.3	65.7	34.7	174.3	1,422.6
1979	1,479.4	927.6	169.9	59.1	7.3	37.2	146.2	109.0	278.3	102.1	67.4	34.8	176.2	1,472.2
1980	1,475.0	931.8	165.8	47.1	−4.4	50.3	159.1	108.8	284.3	106.4	70.0	36.4	177.9	1,479.4
1981	1,512.2	950.5	175.0	44.5	11.3	43.8	160.2	116.4	287.0	110.3	73.5	36.7	176.8	1,500.9
1982	1,480.0	963.3	166.9	37.9	−10.4	29.7	147.6	118.0	292.7	117.0	79.1	37.9	175.7	1,490.4
1983	1,534.7	1,009.2	171.0	53.7	−3.6	12.6	139.5	126.9	291.9	116.2	84.7	31.5	175.7	1,538.3
1984	1,639.3	1,062.4	204.9	60.2	24.8	−15.0	146.0	161.1	302.1	122.5	89.6	32.9	179.6	1,614.5
1982: III	1,477.1	964.2	163.9	36.8	−6.4	25.7	146.6	120.9	292.8	117.2	80.6	36.6	175.7	1,483.5
IV	1,478.8	976.3	161.5	40.8	−24.6	24.1	136.7	112.6	300.6	124.8	81.9	42.9	175.8	1,503.4
1983: I	1,491.0	982.5	161.6	46.2	−16.5	22.9	138.2	115.3	294.3	119.0	83.3	35.7	175.3	1,507.5
II	1,524.8	1,006.2	165.3	53.4	−6.1	13.6	137.0	123.4	292.4	117.2	84.8	32.3	175.2	1,530.9
III	1,550.2	1,015.6	172.6	57.2	.9	11.9	141.6	129.7	292.0	115.6	84.4	31.2	176.4	1,549.3
IV	1,572.7	1,032.4	184.5	57.8	7.2	2.0	141.0	139.1	298.8	113.0	86.3	26.7	175.8	1,565.4
1984: I	1,610.9	1,044.1	193.3	60.6	31.6	−8.3	144.9	153.2	289.5	112.2	87.1	25.2	177.3	1,579.3
II	1,638.8	1,064.2	202.9	60.8	20.3	−11.4	144.7	156.2	302.1	123.2	89.6	33.6	178.9	1,618.5
III	1,645.2	1,065.9	209.5	60.1	30.6	−27.0	147.4	174.4	306.1	125.0	89.1	36.0	181.1	1,614.6
IV	1,662.4	1,075.4	213.8	59.2	16.8	−13.4	147.1	160.5	310.5	129.6	92.7	36.8	180.9	1,645.6
1985: I	1,663.5	1,089.1	213.0	60.0	19.1	−29.4	143.7	172.1	310.7	129.8	92.7	37.1	180.9	1,644.4
II	1,671.3	1,102.1	220.3	60.9	8.3	−33.8	137.9	171.8	313.5	129.7	94.3	35.4	183.9	1,663.0
III p	1,688.9	1,116.5	218.2	62.6	2.5	−38.4	138.0	176.4	327.5	141.3	99.9	41.4	186.2	1,686.4

Source: Department of Commerce, Bureau of Economic Analysis.

IMPLICIT PRICE DEFLATORS FOR GROSS NATIONAL PRODUCT

Column one

[1972 = 100; quarterly data are seasonally adjusted]

B

Period	Gross national product	Personal consumption expenditures				Gross private domestic investment		Exports and imports of goods and services		Government purchases of goods and services			
		Total	Durable goods	Nondurable goods	Services	Nonresidential fixed	Residential fixed	Exports	Imports	Federal			State and local
										Total	National defense	Non-defense	
1976	132.34	131.7	123.9	137.2	129.6	138.6	140.7	155.3	185.6	133.5	132.4	135.7	138.3
1977	140.05	139.3	129.2	143.6	139.3	146.3	158.0	161.9	205.5	142.8	141.9	144.6	148.4
1978	150.42	149.1	136.4	153.4	150.0	157.2	178.3	172.6	214.1	153.1	152.7	153.8	159.7
1979	163.42	162.5	145.0	169.9	162.3	170.8	200.5	192.5	246.1	164.8	166.0	162.5	173.7
1980	178.42	179.0	156.2	188.1	178.8	186.2	218.5	212.9	289.4	185.2	187.5	180.8	191.5
1981	195.60	194.5	167.1	202.5	196.8	202.2	234.1	230.9	293.8	207.6	209.1	204.7	208.0
1982	207.38	206.0	174.5	208.7	213.6	209.5	241.3	236.0	279.3	221.4	227.0	209.8	222.5
1983	215.34	213.6	177.7	213.0	226.0	206.4	246.4	241.0	271.5	232.1	236.6	220.0	236.7
1984	223.43	220.4	179.0	217.7	237.6	207.8	255.7	249.4	266.0	241.2	247.2	224.7	251.7
1982: III	208.53	207.6	175.5	209.6	215.6	208.8	241.8	236.2	280.9	223.2	227.4	213.9	224.7
IV	210.27	209.6	175.6	210.5	219.4	210.1	240.0	235.3	280.1	223.8	233.1	206.2	228.4
1983: I	212.37	210.7	176.6	210.2	221.9	207.1	245.2	237.7	267.8	229.4	233.7	219.4	231.5
II	214.25	212.8	176.8	212.6	224.9	205.2	243.0	239.4	271.0	230.8	234.8	220.3	234.9
III	215.89	214.8	178.0	214.5	227.3	205.1	248.7	241.5	276.3	232.8	237.9	219.1	238.4
IV	218.21	216.0	179.3	214.8	229.7	208.1	248.3	245.4	270.3	235.6	240.0	221.4	241.3
1984: I	220.58	218.0	179.0	217.4	232.6	206.3	249.4	247.7	267.9	238.5	245.1	215.5	246.4
II	222.40	219.2	179.5	216.4	236.0	207.4	255.9	250.4	269.6	240.6	248.4	225.1	250.0
III	224.57	221.5	179.2	217.8	239.7	208.0	258.6	250.1	263.3	241.5	247.4	227.1	253.5
IV	226.10	222.8	178.4	219.4	242.0	209.4	259.1	249.6	263.7	243.7	249.8	228.2	256.9
1985: I	229.07	224.6	179.1	220.1	245.2	211.8	258.6	251.0	252.8	246.4	252.4	231.5	260.9
II	230.55	226.2	178.4	221.2	248.1	212.1	259.3	252.0	257.1	250.1	255.6	235.2	264.7
III p	231.86	227.4	178.1	221.7	251.2	214.8	260.5	251.4	255.6	248.2	255.4	230.9	267.9

Source: Department of Commerce, Bureau of Economic Analysis.

estimates for inflation **within 30 days AFTER the end of the firm's fiscal year** and prior to the submission of financial test documentation to the Regional or State Office.

Prior to October 29, 1986 (the effective date of the May 2, 1986 rules), cost estimates were updated for inflation on the anniversary date of the cost estimate rather than on the anniversary date of the financial assurance mechanism. This change in deadlines may result in a number of one-time adjustment rules that apply the first time an owner or operator of an existing facility renews the financial instrument (or resubmits financial test documentation), or updates the cost estimates under the revised regulations.

The rule for calculating the inflation adjustment factor for the first time under the May 2, 1986 rules will depend on when the cost estimate was last adjusted for inflation under the previous regulations AND the anniversary date of the financial assurance mechanism (or the fiscal year-end date for financial test users). These rules are discussed below.

Rule I: If the cost estimate was last updated between October 29, 1985 and March 1, 1986, and the next update is required between October 29, 1986 and March 1, 1987 (i.e., the anniversary date of the financial instrument or the fiscal year-end date falls within this period), the inflation adjustment factor is calculated by dividing the 1985 Deflator by the 1984 Deflator.[19]

Rule II: If the cost estimate was last updated between March 1, 1986 and October 28, 1986, and the next update is required between October 29, 1986 and March 1, 1987, no adjustment for inflation is required until the period between October 29, 1987 to March 1, 1988. These owners or operators have already updated their estimates to account for 1985 inflation.

Rule III: If the cost estimate was last updated between October 29, 1985 and March 1, 1986, and the next update is required between March 1, 1987 and October 28, 1987, the inflation adjustment factor is calculated by dividing the 1986 Deflator by the 1984 Deflator. These owners or operators must adjust their estimates to reflect 1984 and 1985 inflation.

---

[19] Owners or operators with financial instrument renewal dates between October 29, 1986 and December 27, 1986, will not have the full 60 days to update their cost estimates. Similarly, owners or operators using a financial test with a fiscal year ending between October 1, 1986 and October 27, 1986 will have less than 30 days to update their estimates. In these situations, owners or operators may wish to contact the Regional or State Office or the RCRA Hotline to obtain the Deflators as quickly as possible.

Rule IV: If the cost estimate was last updated between March 1, 1986 and October 28, 1986, and the next update is required between March 1, 1987 and October 28, 1987, the inflation adjustment factor is calculated by dividing 1986 Deflator by the 1985 Deflator.

4.5 DOCUMENTATION FOR COST ESTIMATES

Although the regulations do not specify the format to be used for closure and post-closure cost estimates or the level of detail to be provided, **the cost estimates must contain sufficient detail to allow the Regional or State Office to evaluate their accuracy**. Documentation for the cost estimates should clearly delineate all activities and subactivities consistent with those described in the closure and post-closure plans and include the fully loaded costs of closure and post-closure care, including the costs of labor, equipment, and contingency fees. Documentation supporting cost estimates should also clearly reflect that such estimates are based on third-party costs where required. Five sources that might be used in developing cost estimates for the activities listed in the closure and post-closure plan are:

(1) Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H), November 1986, available through EPA Regional Offices (OSWER Policy Directive Number 9476.00-6);

(2) Owner or operator experience;

(3) Contractor estimates;

(4) Cost estimating handbooks; and

(5) Worksheets and workups.

These data sources are described in more detail below.

4.5.1 Guidance Manual: Cost Estimates for Closure and Post-Closure Plans (Subparts G and H)

This EPA guidance manual contains guidance and information on **key cost components and ranges of unit costs applicable to closure and post-closure care activities.** The manual is organized into four volumes:

- Volume I contains worksheets outlining cost components applicable to facilities with tank, container storage, and incinerator units;
- Volume II contains worksheets outlining cost components applicable to land disposal units;

- Volume III contains information on unit costs of key closure and post-closure care activities (e.g., final cover, certification); and
- Volume IV contains detailed documentation of the unit costs.

4.5.2 Owner or Operator Experience

In many cases, the most readily available source of cost information for existing facilities will be operating records. For example, if an owner or operator routinely ships wastes off site to a TSDF and intends to follow the same procedures during closure, an estimate of the costs of treating or disposing of inventory at closure may be derived from contractor invoices. If an owner or operator intends to construct a cell as part of closure procedures, records of the costs of excavation, installing liners, ground-water monitoring, etc., should be available from internal records. Records from previous partial closures including contracts and invoices for installing final covers, decontaminating facility equipment and soil, and installing security equipment also may provide information to support the cost estimate. Similarly, the costs of ground-water monitoring during the closure and post-closure care period may be similar to the costs of monitoring during the facility's active life.

The cost estimates [illegible] be based on the cost of hiring a third party to conduct closure and po[illegible]re care activities. Thus, the owner or operator must include a [illegible] for hiring third-party labor if current practices include in-house [illegible] and activities.

4.5.3 Contractor Estimates

Many cost estimates, particularly for those services that are to be purchased from a contractor or contractors, may be obtained from the contractor themselves. It is not necessary for documentation purposes to have written and validated cost estimates; a record of the party contacted, the date of the contact, and the estimates given is sufficient.

4.5.4 Cost Estimating Handbooks

Three widely used cost estimating handbooks are the **Means Mechanical Cost Data, the Means Construction Cost Data, and the Means Site Work Cost Data, which are published and updated annually by Robert Snow Means Company, Inc.** Care should be taken in using such manuals. For example, some manuals include costs of administration, normal contingencies, and profits in their unit costs estimations, whereas others do not. In some cases, theoretical work rates must be adjusted to normal field conditions and to include administrative costs.

4.5.5 Worksheets and Workups

Detailed workups of the costs should include an estimate of labor, equipment, energy, and material needs; the basis for these assumptions and the total time required for each activity should be included in the workup. Costs for supervision and administration should be added and adjustments made to account for fully loaded labor and equipment costs.

APPENDIX A

CLOSURE TIMELINES

This appendix contains four timelines that reflect key closure activities and the timeframes in which those activities are conducted. The activities include those performed by the owner or operator in conducting closure and the administrative activities performed by the Regional or State Office during the review and approval of closure plans. These timelines assume that closure activities and plan approval are completed by the deadlines specified in Subpart G. However, the timelines also identify points in time at which extensions to the deadlines may be granted.

The timelines are based on the status of closure plan approval. Therefore, the four timelines address:

(1) Permitted and interim status facilities with approved plans for surface impoundment, waste pile, landfill, and land treatment units; (Exhibit A-1);

(2) Permitted and interim status facilities with approved plans for container storage, tank, and incineration units (Exhibit A-2);

(3) Interim status facilities without approved plans for surface impoundment, waste pile, landfill, and land treatment units (Exhibit A-3); and

(4) Interim status facilities without approved plans for container storage, tank, and incineration units (Exhibit A-4).

The following notes may be helpful when using the timelines:

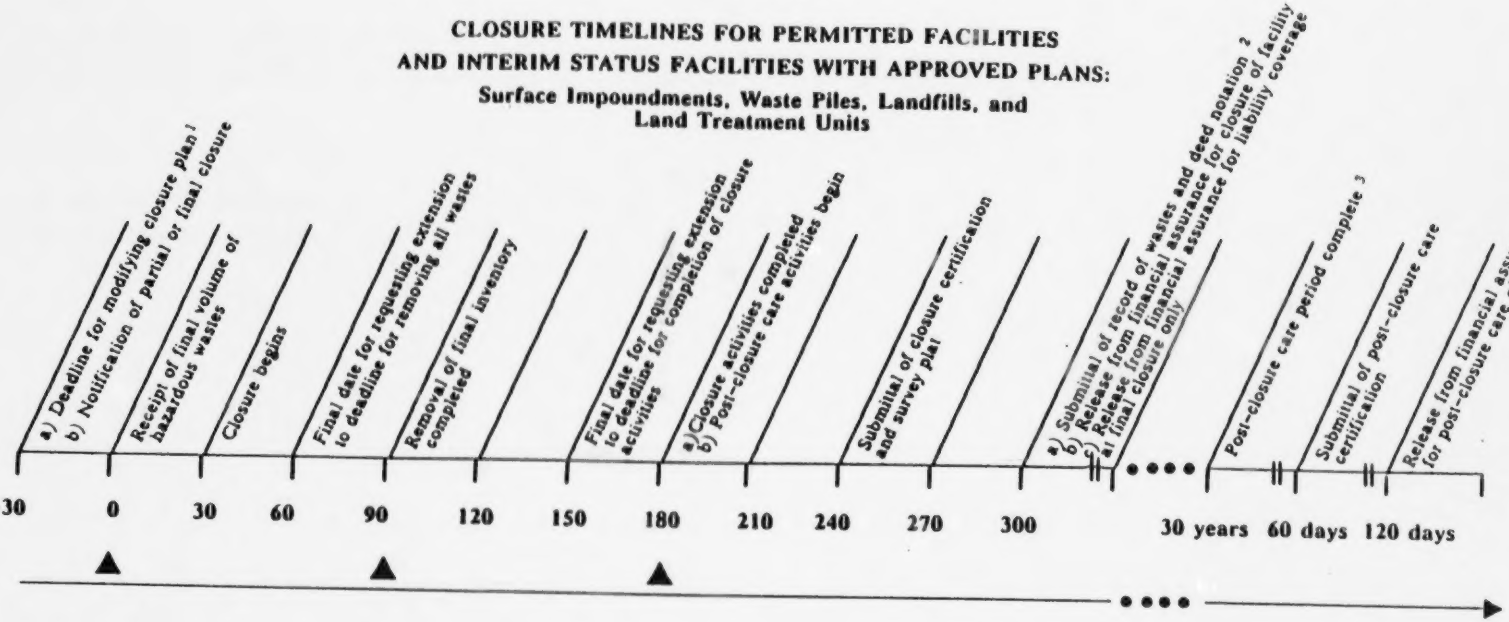
- Receipt of the final volume of hazardous waste occurs at day zero;
- The days correspond to days before or after receipt of the final volume of hazardous waste, with events that occur before that point taking place on "negative" days. The regulations generally measure the closure deadlines from the date of receipt of the final volume of hazardous waste. The deadlines for submission of closure plan and notification of closure, however, are triggered by the "expected date of closure (i.e., within 30 days after the final receipt of hazardous wastes or longer if approved by the Regional or State Office)." In order to minimize confusion that might result if deadlines used different benchmarks, all deadlines including those for submitting the closure plan and notification, use receipt of the final volume of hazardous waste as a benchmark. For example an owner or operator must notify of the intent to close a landfill cell 60 days prior to the expected date of closure. This deadline is denoted on Exhibit A-1 as 30 days prior to the final receipt of hazardous waste;

- The timelines are designed so that the deadline is the last possible day that an event may take place, unless a variance or extension of time is obtained by the owner or operator;
- The legend indicates the points in time when extensions or variances may be requested;
- The description of the event taking place occurs immediately above and to the right of the day by which it must take place; and
- "O/O" refers to the facility owner or operator and "RA" refers to the Regional Administrator.

EXHIBIT A-1

CLOSURE TIMELINES FOR PERMITTED FACILITIES AND INTERIM STATUS FACILITIES WITH APPROVED PLANS:

Surface Impoundments, Waste Piles, Landfills, and Land Treatment Units


a) Deadline for modifying closure plan [1]
b) Notification of partial or final closure
Receipt of final volume of hazardous wastes
Closure begins
Final date for requesting extension to deadline for removing all wastes
Removal of final inventory completed
Final date for requesting extension to deadline for completion of closure activities
a) Closure activities completed
b) Post-closure care activities begin
Submittal of closure certification and survey plat
a) Submittal of record of wastes and deed notation [2]
b) Release from financial assurance for closure of facility
c) Release from financial assurance for liability coverage at final closure only
Post-closure care period complete [3]
Submittal of post-closure care certification
Release from financial assurance for post-closure care of unit
-30
0
30
60
90
120
150
180
210
240
270
300
30 years
60 days
120 days

LEGEND

- ▲ Extension may be granted
- ●●●● On-going post-closure care activities
- ‖ Change in timeline scale

---

[1] The O/O must submit a written request for a permit modification no later than 60 days after an unexpected event has occurred which has affected the closure plan. If such an event occurs during the partial or final closure period, O/O must request a permit modification no later than 30 days after the unexpected event.

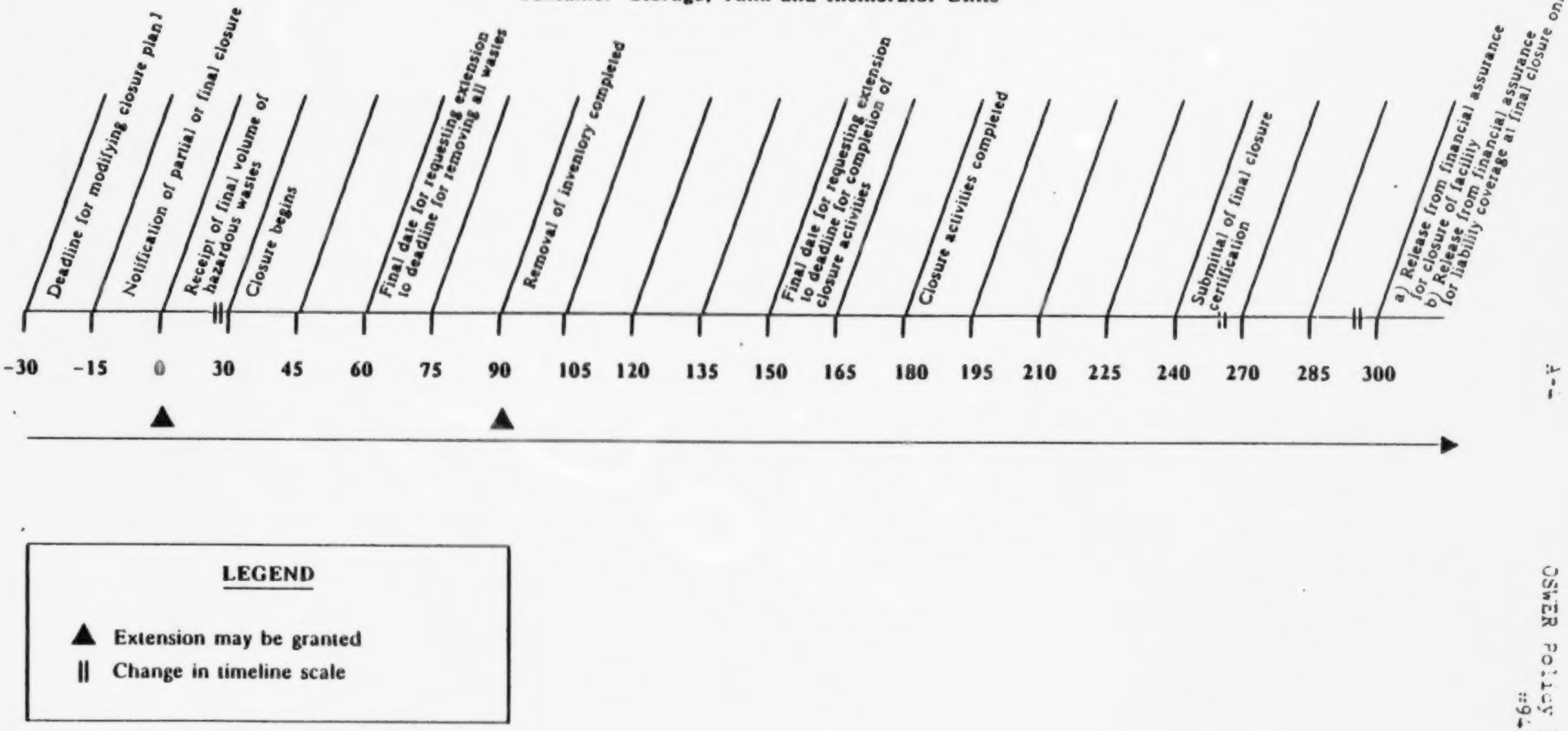
[2] The deed notation must be filed after closure of the FIRST hazardous waste disposal unit. Sixty days after closure of the LAST hazardous waste unit, the deed notice must be amended as necessary.

[3] The RA can reduce or extend the post-closure care period.

EXHIBIT A-2

CLOSURE TIMELINES FOR PERMITTED FACILITIES AND INTERIM STATUS FACILITIES WITH APPROVED PLANS:

Container Storage, Tank and Incinerator Units



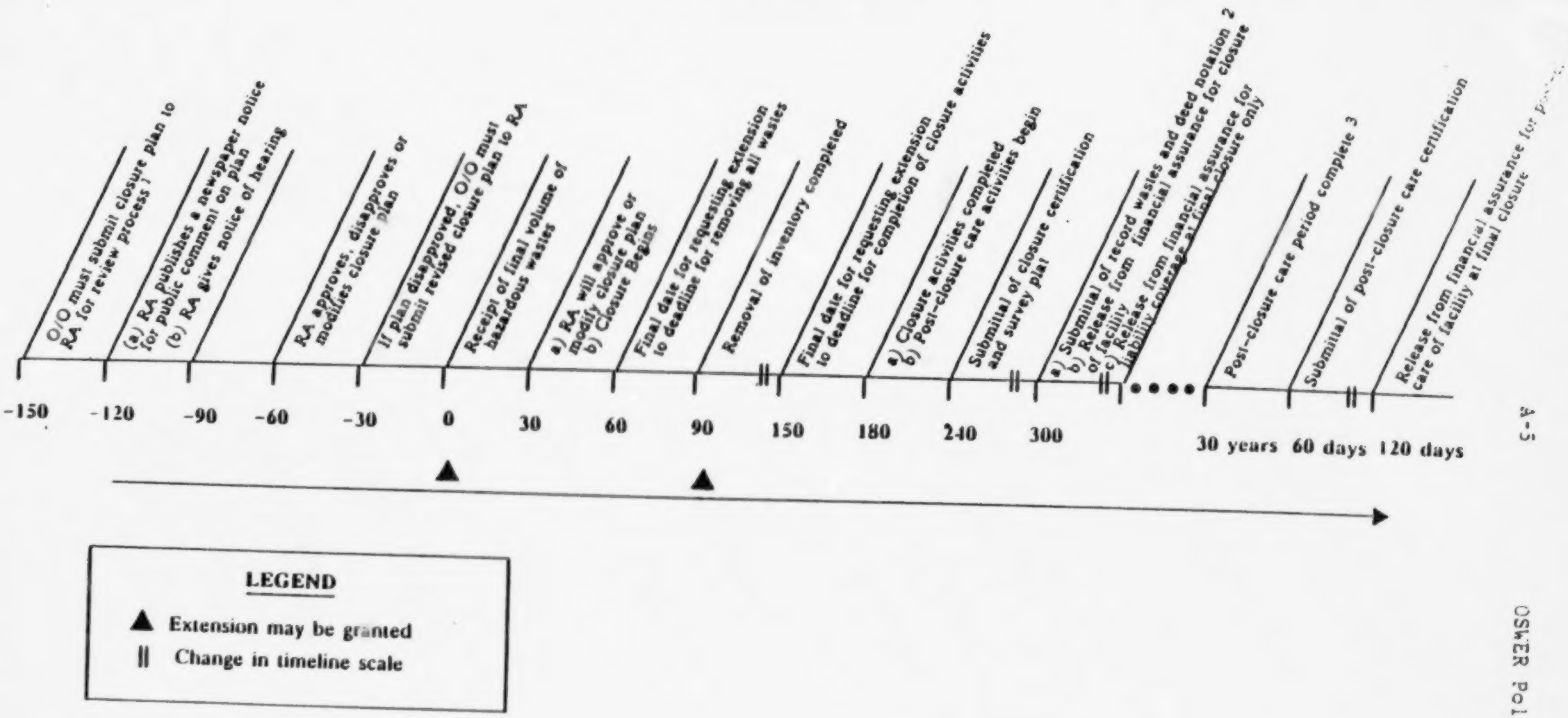
---

[1] The O/O must submit a written request for a permit modification no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, O/O must amend the closure plan no later than 30 days after the unexpected event.

EXHIBIT A-3

CLOSURE TIMELINES FOR INTERIM STATUS FACILITIES WITHOUT APPROVED PLANS:

Surface Impoundments, Waste Piles, Landfills, and Land Treatment Units


O/O must submit closure plan to RA for review process 1
(a) RA publishes a newspaper notice for public comment on plan
(b) RA gives notice of hearing
RA approves, disapproves or modifies closure plan
If plan disapproved, O/O must submit revised closure plan to RA
Receipt of final volume of hazardous wastes
a) RA will approve or modify closure plan
b) Closure Begins
Final date for requesting extension to deadline for removing all wastes
Removal of inventory completed
Final date for requesting extension to deadline for completion of closure activities
a) Closure activities completed
b) Post-closure care activities begin
Submittal of closure certification and survey plat
a) Submittal of record wastes and deed notation 2
b) Release from financial assurance for closure of facility
c) Release from financial assurance for liability coverage at final closure only
Post-closure care period complete 3
Submittal of post-closure care certification
Release from financial assurance for p care of facility at final closure
-150
-120
-90
-60
-30
0
30
60
90
150
180
240
300
30 years
60 days
120 days
LEGEND
▲ Extension may be granted
‖ Change in timeline scale

---

[1] The O/O must submit his closure plan to the RA at least 180 days prior to the date he expects to begin closure.

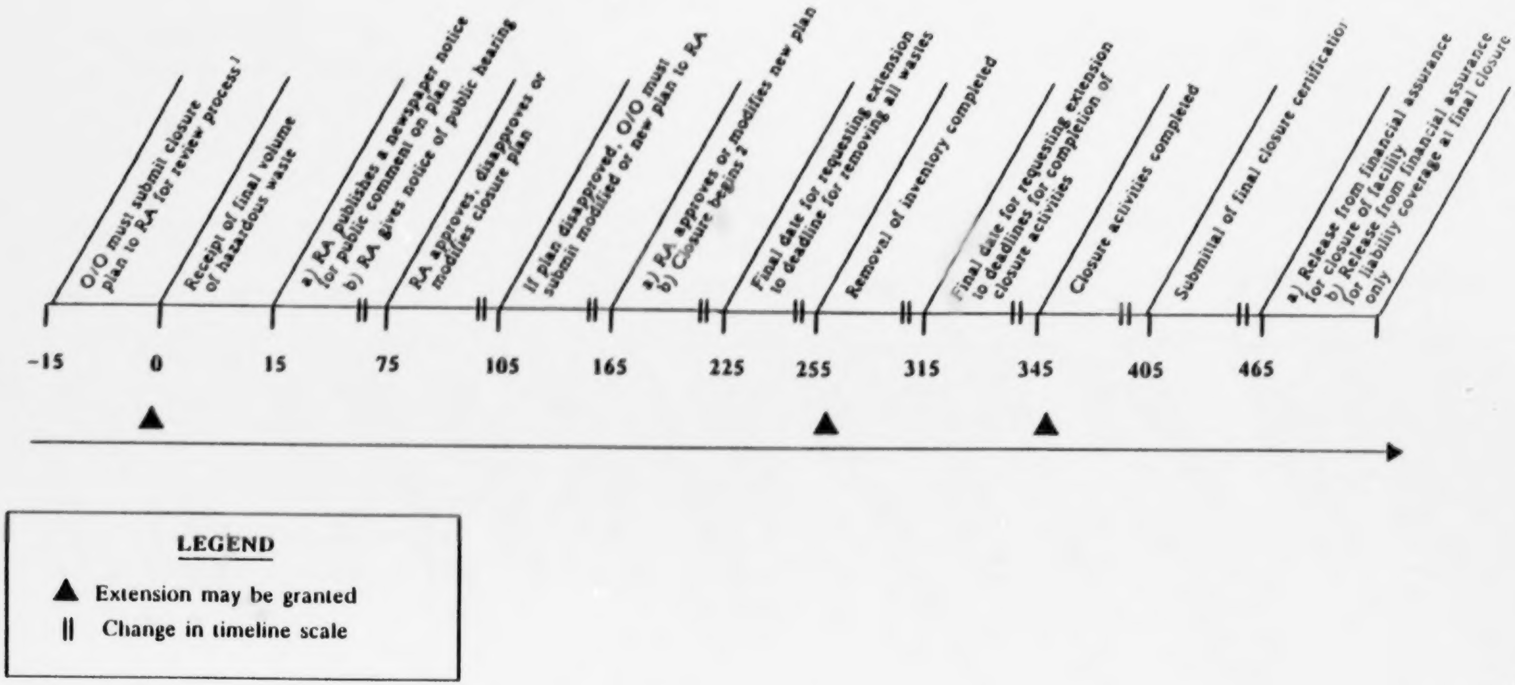
[2] The deed notation must be filed after closure of the FIRST hazardous waste disposal unit. Sixty days after closure of the LAST hazardous waste disposal unit, the deed notice must be amended as necessary.

[3] The RA can reduce or extend the post-closure care period.

EXHIBIT A-4

CLOSURE TIMELINES FOR INTERIM STATUS FACILITIES WITHOUT APPROVED PLANS

Container Storage, Tank and Incinerator Units


O/O must submit closure plan to RA for review process [1]
Receipt of final volume of hazardous waste
a) RA publishes a newspaper notice for public comment on plan
b) RA gives notice of public hearing
RA approves, disapproves or modifies closure plan
If plan disapproved, O/O must submit modified or new plan to RA
a) RA approves or modifies new plan
b) Closure begins [2]
Final date for requesting extension to deadline for removing all wastes
Removal of inventory completed
Final date for requesting extension to deadlines for completion of closure activities
Closure activities completed
Submittal of final closure certification
a) Release from financial assurance for closure of facility
b) Release from financial assurance for liability coverage at final closure only
-15
0
15
75
105
165
225
255
315
345
405
465
LEGEND
▲ Extension may be granted
|| Change in timeline scale

---

[1] The O/O must submit his closure plan to the RA at least 45 days prior to the date he expects to begin closure.

[2] O/O may begin conducting limited closure activities prior to plan approval but is not required to complete removal of inventory until 90 days after the plan is approved.

APPENDIX B

TECHNICAL EVALUATION CRITERIA AND SITE-SPECIFIC FACTORS TO CONSIDER IN DETERMINING THE LENGTH OF THE POST-CLOSURE CARE PERIOD

The Subpart G regulations give the Regional Administrator or State Director the authority to extend the length of the post-closure period beyond 30 years or reduce it on a case-by-case basis. He also may temporarily extend or reduce the length of the period or temporarily suspend certain activities based on cause. In addition, the owner or operator or member or the public may petition the Regional Administrator or State Director to change the length of the period.[1]

This section suggests factors that may be appropriate to consider in evaluating the length of the post-closure care period and in preparing documentation to support a petition to extend or reduce the period. Section B.1 discusses broad technical criteria that should be examined and Section B.2 presents facility-specific technical factors that may affect the decision.

This appendix also presents a number of hypothetical scenarios illustrating how site-specific information might be used to support an extension or reduction in the length of the period. Although all of the scenarios are hypothetical, they indicate the types of information that should be examined and how the technical criteria and site-specific factors may be evaluated.

The hypothetical scenarios referenced in this appendix are not intended to represent all the possible situations that could be encountered. Rather, the scenarios describe the types of information that should be considered given a hypothetical set of facility conditions, present a decision under these particular conditions, and describe the rationale for the hypothetical decision.

B.1 Technical Evaluation Criteria to Consider in Determining the Length of the Post-Closure Care Period

The following four technical evaluation criteria provide a framework for assessing how well a unit or facility will protect human health and the environment:

(1) **Containment** - How long will the unit or facility contain the wastes after closure?

(2) **Detection** - Will the systems currently in place at the unit or facility detect releases of hazardous wastes?

---

[1] 40 CFR 124.5(a), 265.118(g), and 270.41.

(3) **Migration and Attenuation** - Will the wastes migrate off site, and will the leachate be attenuated in the environment?

(4) **Risk Potential** - Who potentially will be exposed to a waste release, how toxic are the waste constituents, and, consequently, what risks are involved?

B.1.1 Containment

The first and foremost objective for the design and operation of any disposal unit is the isolation of the hazardous wastes. Thus, **when evaluating the containment criteria, emphasis should be placed on determining when a likely release of leachate will occur and its potential magnitude**.

The most important parts of a containment system are the liner (single, double, or triple) and the cover or cap. The purpose of the liner is to contain the wastes in place and minimize ground-water contamination. The cap is designed to minimize infiltration of water into the unit, and thereby prevent the formation of leachate. (Generally, land treatment units are not capped because they are designed for waste degradation rather than waste containment. This distinction is discussed more fully in Section B.2.1.1.)

Improvements in landfill technologies (e.g., double synthetic liners) generally will result in longer, though not permanent, waste containment. Virtually every disposal facility, no matter what the design, will eventually leak and realease leachate. Releases due to improper design, construction, installation, or operation of the unit are more likely to occur and be detected prior to the end of the 30-year post-closure care period. Releases due to the eventual degradation or wearing-out of the containment devices may take longer than 30 years to occur. Nevertheless, **because most wastes contained within landfills undergo limited chemical or biological degradation as a result of the isolation, toxicity, and volumes of the wastes, releases caused by the eventual wearing-out of a facility will still pose a significant risk to human health and the environment.** The processes and rates of hazardous waste degradation will vary for different chemicals and for site-specific conditions found at facilities, including chemical/physical properties (e.g., anaerobic or aerobic conditions, potential pH) and biological properties (e.g., the specific microbial population within the landfill cell). In most cases, biological degradation of hazardous waste constituents will occur at very slow rates because microbial populations are limited by the highly contaminated environment. In addition, many of the constituents that promote microbial growth, and therefore chemical degradation, such as light, water, and oxygen, are restricted by the landfill cover. Therefore, significant degradation of hazardous wastes will not begin until the wastes have been released from the containment systems.

In summary, based on purely technical considerations concerning containment, any slowly degradable toxic waste that is placed in a landfill or other containment facility has the potential to damage human health and the environment. Moreover, this damage may occur over a very long timeframe well in excess of the standard 30-year post-closure care period. As a result, monitoring until all the soluble hazardous wastes have been removed or have leached off site, or until the owner or operator has demonstrated that local environmental conditions will limit potential ground-water contamination to acceptable levels may be appropriate.

B.1.2 Detection

Monitoring for leachate generation and releases serves as the most effective means of checking the integrity of a hazardous waste management unit during the post-closure care period. If wastes are detected beyond the containment boundaries, corrective action can be taken to prevent continued migration of the wastes off site. In evaluating ground-water monitoring results, it is important to keep in mind that there is a lag between leachate generation and release and migration to the point of detection. In addition, in some cases, improper well placement in relation to containment facility configuration, well construction, ground-water movement, and characteristics of the leachate migration may preclude detection of a release. If leachate is detected, the results may indicate that either corrective action is warranted or extended post-closure monitoring is needed to ensure that the release does not pose a threat to human health and the environment.

B.1.3 Migration and Attenuation

The extent to which leachate will migrate and pose a threat is a function of two general factors: (1) **environmental transport** (e.g., ground-water discharge rates) and (2) **waste characteristics** (e.g., adsorptivity and degradability).

If migration of a release is expected to be very slow, then virtually no risks may be associated with a release over the short term because the wastes will not contaminate drinking water supplies that are in use. In such a case, post-closure care monitoring would have to be extended over a very long period to ensure that a slowly moving contaminant plume would be detected. On the other hand, rapid migration would allow for earlier detection but may also pose a greater threat to drinking water supplies. Thus, the predicted migration patterns and rates will affect the determination of an appropriate duration for post-closure care monitoring.

The extent to which wastes have degraded during containment is also important to the evaluation of the long-term hazards. For example, land treatment facilities are designed to promote continuing degradation; therefore, the danger of serious releases from those units or facilities presumably will decline over time. In contrast, the isolation of wastes in landfills can actually inhibit degradation, thereby maintaining the hazardous constituents over a longer period. In addition, many hazardous wastes simply do not readily degrade.

B.1.4 Risk Potential

The overall risks stemming from hazardous waste management are determined by the likelihood of exposure to the waste, and the effects associated with that exposure. The severity of a release is a function of the leachate concentration at the point of release, and more importantly, the leachate concentration at the point of exposure. If a unit's containment systems degrade very slowly, the structure of the liners (if present) should attenuate the leachate migration rate and limit the releases to low concentrations over long periods of time. In addition, the leachate may further adsorb, degrade, and otherwise be attenuated in the environment. Finally, only low levels of risk may be associated with chronic exposures at low concentrations to certain waste constituents. If only "low toxicity" wastes are present in a unit or facility, the risk associated with exposure to these wastes would be relatively low. These several factors, alone or in combination, may limit the risks associated with a release from a unit or facility and, therefore, lessen the need to extend the post-closure ground-water monitoring period.

B.2 Site-Specific Technical Factors Involved in Evaluating the Length of the Post-Closure Care Period

Exhibit B-1 summarizes the relationship between the general evaluation criteria discussed in Section B.1 and the site-specific technical factors. The exhibit also identifies the types of information that could support a request to the Regional Administrator or State Director to alter the length of the post-closure care period. The three categories of facility-specific factors are:

(1) **Facility characteristics;**

(2) **Waste type and characteristics;** and

(3) **Environmental and health considerations.**

Although these three categories are addressed separately, they cannot and should not be assessed independently of one another. For example, in assessing the adequacy of a facility's design, its environmental setting and the types of wastes that are being contained must also be examined. To help illustrate how site-specific technical factors may influence the length of the post-closure care period, the following sections refer to hypothetical scenarios summarized on Exhibit B-2. These scenarios are intended for illustrative purposes only and should not be considered directly applicable to any particular facility. However, they may help to clarify the kinds of information that deserve consideration.

B.2.1 Facility Characteristics

An assessment of the following facility characteristics will give a general indication of the expected ability of the facility to contain wastes over the long term:

EXHIBIT B-1

SUMMARY OF CONSIDERATIONS FOR EVALUATING THE LENGTH OF THE POST-CLOSURE CARE PERIOD

GENERAL EVALUATION CRITERIA	SITE-SPECIFIC TECHNICAL FACTORS	ANALYTICAL COMPONENTS
Containment	Cap	Materials (clays, synthetics), permeability, soil and vegetative cover
	Liner	Materials (clays, synthetics), permeability, compaction
	Facility Design	Structural stability, topography
	Post-Closure Care Experience	Maintenance, inspections, repair procedures
	Environment	Precipitation, flood plains, soil types, depth to ground water
	Waste Characteristics	Effect on containment, long-term degradability
	Corrective Action	Effect on containment, maintenance
Detection	Leachate Collection	Possibility of "short-circuit" of leachate through collection system, stability, sampling and analysis schedule, history of leachate collected
	Ground-Water Monitoring	Hydrogeology, well location, well number and depth, background concentrations, sampling and analysis schedule
	Unsaturated Zone Monitoring	Soil type, waste degradation rates, sampling and analysis schedule, history of waste concentration measurements
Migration and Attenuation	Ground Water	Depth to ground water, hydraulic gradient, hydraulic conductivity
	Surface Water	Slope, precipitation, flood plains
	Waste Characteristics	Adsorptivity, degradability, reactivity, solubility, volatility, viscosity
	Subsurface Media	Adsorption sites, geochemistry
Risk Potential	Waste Toxicity	Acute and chronic toxicity, general health hazards, ecotoxicity
	Exposures	Drinking water well locations and depths, surface waters, bioaccumulation
	Population Characteristics	Populations of drinking water users, age distributions
	Environmental Considerations	Surface waters, wetlands, land use, agriculture, ecologically sensitive habitat

EXHIBIT B-2

HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
1. A land treatment facility contains mildly hazardous waste and is being closed. The surrounding soil has low permeability and the treatment zone is three feet above the seasonally high water table. Ground water is the sole source of drinking water for a nearby town. Unsaturated soil monitoring results indicate contamination levels slightly above background.	- Amount and type of wastes disposed in the facility - Depth to the water table - Potential migration of contaminants from the facility - Direction and rate of ground water flow - Likely contamination of drinking water wells - Analysis of monitoring results to determine whether contamination is statistically detectable	Maintain the length of the post-closure care period at 30 years. The RA can reevaluate unsaturated zone monitoring results at a later date to determine whether the post-closure care period may be reduced or should be extended.	The combination of mildly hazardous wastes, low soil permeability, and a large treatment zone in a well-run facility suggest that ground-water contamination should be minimal. However, because the ground water is a sole drinking water source, monitoring should not be terminated until results indicate that background levels are no longer exceeded.
2. The facility contains a double-lined disposal surface impoundment equipped with a leachate detection system which satisfies 40 CFR 264.221(c). The impoundment contains mildly toxic wastes. No leaks have been detected 6 years into the post-closure care period. The ground water table is located 80 feet below the bottom of the impoundment (deep aquifer). The aquifer is a poor drinking water source. The facility is located in a sparsely populated area.	- Size of impoundment - Integrity of the liner system/containment system - Amount and type of waste substances disposed in the facility - Environmental fate of the waste substances - Population at risk - Future uses of the ground water	Temporary reduction of post-closure care activities on a trial basis.	Ground water source is deep, and is a poor drinking water source. If containment system fails, ground-water source is deep and of such poor quality that minimal threat exists to human health and the environment. Aquifer is not hydrologically connected to aquifers currently or potentially used as drinking water sources in a way that would allow contaminants to migrate to these waters. Limited population at risk. Post-closure activities may be reinstated if a release is detected.

EXHIBIT B-2

HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
3. A clay lined landfill (80 acre facility divided into 20 cells) contains municipal solid waste, paint sludges, and electroplating waste. The clay liner permeability is 10^{-5} cm/sec. Leachate has migrated off site and has contaminated the potential drinking water use aquifer underlying the site. Corrective action activities are being taken at the site to contain plume migration. Population of 20,000 within $3m^2$ of the site.	- Amount and type of waste disposed in the facility - Concentration and type of contaminants in leachate plume - Rate of migration of the plume - Activities associated with corrective action - Potential expense to leachate plume - Population at risk	Post-closure care period should be extended beyond 30 years.	Ground water corrective actions are being taken at the site. The poor liner design of the landfill suggests the potential for additional releases. A substantial population may be at risk. The aquifer underlying the site may be used as a potential drinking water source.
4. A landfill cell contains very hazardous waste, including trichloroethylene and cyanides. The landfill has a double liner and no evidence of ground-water contamination has been detected around the facility for the first ten years of the post-closure care period. The facility is located over highly permeable soils (K=10^{-3} cm/sec) and over a deep sole-source aquifer.	- Amount and type of waste disposed in the facility - Integrity of the cap and overall containment system - Ability to detect releases over the short term - Likely migration of potential release - Population at risk	Post-closure care and monitoring activities should continue for the duration of the 30-year period.	A lack of contaminant detection does not mean that a leak has not or will not occur. Such a risk poses a serious threat due to the toxicity of the wastes, the high permeability of the surrounding soil media, and the importance of the underlying aquifer.

EXHIBIT B-2

HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
5. A one hundred acre landfill is located in a 100-year flood plain. The facility is designed to handle 350,000 tons/yr at maximum design capacity. The site is filled in 20-acre units. The landfill is equipped with a well-designed liner and a leachate collection and removal system capable of removing leachate generated as well as rainfall which enters the active portion of the cell. At this point in time, 3 cells have been closed The cells contain a variety of wastes including metals such as lead. One closed unit has experienced several leaks which have been repaired. The perimeter dike was flooded during a 100-year storm event and has been replaced. Leachate and run-off generated during the flooding event contained metals, trichloroethylene, and benzene in high concentrations. Ground-water monitoring systems are designed for each individual cell.	- Characteristics of the liner and final cover - Maintenance of the ground-water monitoring system, the leachate control system, and the run-off control system at the facility - Amount and type of waste in the landfill - Mobility and expected rate of migration of waste - Site location, topography, and surrounding land use - Geological and soil profiles, and surace and subsurface hydrology	The owner/operator must perform 30-year post-closure care on the two cells that have already been closed. For the third closed cell that has experienced leaks, the post-closure care period is extended beyond thirty years to ensure continued ground-water monitoring. At the time of closure of the remaining two cells, facility conditions will be reexamined to assign post-closure care periods to these units and evaluate whether the periods for the previously closed cells should be extended.	Because the landfill cells are designed with independent monitoring systems, the post-closure periods are assigned on a per-unit basis. However, the facility's location and the toxicity, virtual non-degradability, and potential for migration in the environment of the metal wastes make it appropriate to reevaluate facility conditions as each unit is closed. Especially because one closed cell has experienced leaks, it is prudent to ensure that ground-water monitoring continues long enough to detect releases from all units.

EXHIBIT B-2

HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
6. Several lined surface impoundments on a site are to be closed. The closure plan provides for the removal of all standing liquids, and stabilization of remaining wastes, waste residues and contaminated materials. The first phase of the closure plan will result in: (1) the removal of all liquids; (2) the chemical fixation of all sludges in the ponds; (3) the backfilling of the ponds with clean soil. Wastes placed in the disposal unit contain toluene, carbon tetrachloride, and methylene chloride. The final cover will consist of a synthetic membrane liner, a drainage layer, and protective and vegetative covers. Leachate will be sampled for pH, chlorinated organics and specific conductance. The aquifer underlying the site is used as a drinking water source.	- Permeability of the liner materials--clay and geotextiles - Pressure head of leachate on liner - Climatic conditions in area - Physical and chemical properties of soil that supports liner - Potential for damage to the liner system - Volume of leachate/run-off produced at the facility - Options for managing leachate/run-off collected at the facility - Design of the ground water monitoring system; sampling schedule for wells - Amount and type of waste disposed in the facility - Migration of the wastes in the event of a release - Potential population exposed to a release and at risk	The owner/operator must perform 30 years of post-closure care. An extension to the care period may be needed if contaminant concentrations exceed ground-water standards set for the aquifer.	The aquifer under the site is currently used and supplies drinking water to a large town located 2 miles from the site. Therefore, there is a significant population at risk.

EXHIBIT B-2

HYPOTHETICAL SCENARIOS ILLUSTRATING DECISIONS ON THE LENGTH OF THE POST-CLOSURE CARE PERIOD

Scenario/Description	Factors to Consider	Decision	Rationale
7. The facility is a 50-acre landfill located in a remote and arid area. The facility is lined with a 2-foot, thick clay liner. Annual precipitation is low, but the area is subject to heavy rains in the early spring. Wastes have accumulated to a maximum of 20 feet above grade. The wastes disposed in the facility include waste solvents, pesticides, tar residues, and oily sludges. The site is located in sandy-clay soils with slow to moderate permeability. Depth to ground water varies from 15-30 feet. The aquifer is currently in use. The ground water serves as the water supply for a sparsely populated residential area. A small stream containing game fish is located approximately 1/3 mile from the site. The slope of the landfill is slightly eroded, and run-off is reaching the stream, contributing to occasional flooding during peak rainfalls. Low levels of chlorinated organics have been detected in the drinking water supply of residents located near the site in the 20th year of the facility's post-closure care period.	- Integrity of clay materials lining the facility - Stability of western slope of landfill - Volume of leachate generated and integrity of the leachate collection system - Limits of the permeability of the clay - Solubility of the waste materials - Concentration of constituents in the run-off reaching the stream - Ground water gradient and flow rate - Amount and type of wastes in the landfill - Population at risk	The post-closure care period should be extended by five years to ensure that levels of contaminants in drinking water do not increase the risk of harm to human health. Regrading of western slope should also be undertaken to ensure the structural integrity of the landfill. The period will be reevaluated after five years to determine if another extension is required.	An extension is appropriate because the potential exists for extensive ground-water contamination and for further failures of the landfill, which could both increase human health risks and danger to the environment.

(a) Process type;

(b) Facility design;

(c) Waste management (operational) practices; and

(d) Corrective action activities.

B.2.1.1 Process Type

Landfills, land treatment units, and disposal surface impoundments retain hazardous wastes after closure. In addition, storage impoundments, waste piles and tank systems that cannot be "clean closed" also must be closed as landfills.

Land treatment is designed to promote the degradation of constituents placed in or on the treatment zone, to transform them into non-hazardous constituents, or to immobilize them. The purpose of the post-closure care period is to allow continuing degradation of the wastes in the unit. Thus, the post-closure care period in effect serves as an extension of the active life of the land treatment unit. If an owner or operator of a land treatment unit expects that the waste constituents will degrade before the end of the 30-year post-closure care period, he may submit a demonstration to the Regional Administrator or State Director in accordance with the provisions in 40 CFR 264.280(d) showing that the level of hazardous constituents in the treatment zone does not exceed background values. (See Scenario 1 in Exhibit B-2.) In contrast to land treatment facilities where hazardous constituents are assumed to become non-hazardous over time, post-closure activities at all other types of units closed as landfills are designed exclusively to contain the hazardous wastes over the long term.

B.2.1.2 Facility Design

The function of a waste management system is to CONTAIN and DETECT the formation and minimize the escape of leachate, gases, and solids from the unit into the environment. Facility design characteristics which may influence the length of the post-closure care period are:

- Facility size;
- Liner;
- Final cover;
- Leachate collection, detection and removal systems;
- Control of run-on and run-off, and
- Ground-water monitoring system.

Facility Size. Facility size could be important if the facility has numerous disposal units and operates for a large number of years. A typical landfill operation closes individual cells as their disposal capacity is reached. Therefore, for facilities that contain many cells and continue operating over a long time span, an individual cell could be receiving hazardous waste 30 years or more after the first cell at the facility was closed. In this situation, some units will be conducting post-closure care activities while others will be actively receiving wastes. Unless the cells are hydrologically independent and have separate containment and monitoring systems, it may be appropriate to evaluate the length of the post-closure care period on a facility-wide rather than on a per-unit basis.

Liner. Liners are required for landfills, surface impoundments and waste piles **to contain and prevent migration of leachate** from a unit or facility. The effectiveness of a liner or liner system may vary according to the number of liners, the liner thickness, and the liner materials.[2]

Disposal units are often lined with compacted clay soils or synthetic materials. Both types of liners can react with certain wastes thus causing liner degradation and increasing the permeability of the liners over time. For example, strong acids capable of dissolving soil components increase the permeability of clay barriers, and some organic solvents degrade synthetic liners. The likelihood of liner degradation should be evaluated individually, because the processes depend on the site-specific composition of both the leachate and the liner material.

Although liners may remain effective in preventing waste migration from the unit until well after closure, their principal role occurs during the active life of the unit. While the unit is operational, the liner is relied upon to contain the hazardous wastes. Liquids are removed during operation of the facility, at closure, and during post-closure care, to further protect the integrity of the liner. Scenario 2 in Exhibit B-2 illustrates how the integrity of the liner system may influence the decision about the length of the post-closure care period.

Final Cover. A final cover that remains viable prevents releases by minimizing leachate formation through infiltration. Cover materials may include clay, synthetic liners, or natural soil, all of which may vary in thickness and may or may not have an upper vegetative covering. The regulations specify, however, that the cover must be at least as impermeable as the bottom liner.[3] In addition, if a synthetic layer is used in the bottom liner, a synthetic layer must also be used in the cover. **Because of the importance of the final cover in preventing releases, the Regional Administrator or State Director should consider how well the cover has performed during the post-closure care period to date.**

---

[2] 40 CFR 264.221(c), 264.301(c), 265.221(a), and 265.301(c) require double liners and leachate collection systems for new impoundments and landfills, and §§264.251 and 265.251 require single liners and leachate collection systems for new waste piles which will reduce some of the variations currently found in facility designs.

[3] 40 CFR 264.310 and 265.310.

Leachate collection, detection, and removal systems. Most surface impoundments, waste piles and landfills are required to have leachate detection and removal systems installed above the lowest liner. New landfill units must have leachate collection systems both above and below the upper liner.[a] The owner and operator must continue to operate the leachate collection and removal system during the post-closure care period until leachate is no longer detected. If leachate is generated well into the post-closure care period, this could suggest a cover or liner failure warranting an extension of the post-closure care period. On the other hand, **if leachate is not detected or collected in the system,** the Regional Administrator or State Director should evaluate whether the leachate collection system is **functioning properly**, i.e., whether it is capable of withstanding chemical attack from leachate-containing materials in the facility, whether it can withstand pressure from the weight of the overlying waste, and whether it functions without clogging.

Control of run-on and run-off. Various structures such as dikes, berms, freeboard, foundations and above-ground structures must be maintained during the post-closure care period to control run-on and run-off and aid containment. Because such structures are integral to the prevention of leachate formation, both the design of the structure and its maintenance will affect the facility's ability to prevent releases and may influence the appropriate length of the post-closure care period.

Ground-water monitoring system. Ground-water monitoring is the primary means of detecting leachate releases and must be continued at disposal facilities throughout the post-closure care period. In addition to reviewing the results of monitoring tests, the reliability and sensitivity of the ground-water monitoring system should be examined before accepting the results at face value. Contaminants in ground water experience relatively little mixing or dispersion, and, as a result, plumes of these contaminants remain concentrated. The plumes move slowly through most aquifers (generally in the range of five to 50 feet/year) and typically remain for many years. An individual plume may underlie only a very small part of the land surface and therefore can be extremely difficult to detect. If, for example, the integrity of the containment is in doubt yet the ground-water monitoring system has not detected any contamination, the construction of additional wells and continuation of the monitoring period may be appropriate.

---

[a] 40 CFR 264.221(c), 264.251(c), 264.301(c), 265.221(a), 265.254, and 265.301(a).

B.2.1.3 Waste Management (Operational) Practices

Even the best-designed unit or facility must be managed properly in order to prevent releases. Improper management during a facility's active life (including early years of post-closure care for units closed prior to final closure) could put excessive stress on facility structures or could result in contamination of subsoils that might only be discovered as ground-water contamination during the post-closure care period. The following management practices are among those that help to ensure facility integrity:

- **Routine maintenance and inspections** designed to detect equipment malfunctions and physical damage to final cover (e.g., cracks, erosion);
- **Emergency procedures** to handle natural disasters and catastrophic events (e.g., flooding caused by a meteorological event);
- Fast and efficient **responses to accidents/spills** that may occur; and
- **Good compliance records.**

Although sound waste management practices are not in themselves sufficient to justify a reduction in the length of the post-closure care period, a well-managed facility is more likely to maintain its structural integrity and have monitoring records that could support such a reduction. On the other hand, poor management practices may justify an extension of the period to the extent that these practices have increased the likelihood of a serious release occurring which would result in a threat to human health and the environment and the potential need for corrective action. For example, a history of frequent spills during the operating life of a facility may suggest that the post-closure care period should be extended to increase the likelihood that future ground-water contamination resulting from these spills is detected and corrective action is undertaken if needed. Information on waste management practices (e.g., reports from on-site inspections; records of violations and compliance orders issued; documentation regarding closure plan review; and partial and final closure certifications) should be readily available to the Regional Administrator or State Director.

B.2.1.4 Corrective Action Activities.

Depending on the timing of a release and the duration of the corrective action, the compliance period and corrective action may extend beyond the 30-year post-closure care period. The regulations do not specify, however, whether the post-closure period should be extended to be consistent with these requirements. Nevertheless, **the Agency may consider requiring an extension of the post-closure period when the corrective action continues beyond the thirty-year post-closure care period** to ensure that the contamination problem is not exacerbated by new releases from the containment system. Although compliance monitoring is conducted along with the corrective action, continued post-closure care detection monitoring would alert the Regional

Administrator of contamination that is more wide-spread than originally believed, or to additional releases that may occur. Scenario 3 in Exhibit B-2 illustrates the factors that should be considered at a facility undergoing corrective action.

B.2.2 Waste Types and Characteristics

As discussed in Section B.1, **the migration and attenuation of the waste determine how widely the waste may be dispersed in the environment and whether the release will ultimately lead to human exposure**. Thus, these factors determine the **risk potential** for the waste. If a unit contains toxic wastes which pose a significant environmental hazard due to their persistence and mobility, all else being equal, it may be appropriate to consider extending the post-closure care period. Waste characteristics are defined by the physical and chemical properties of the wastes, including:

- **Degradability**: The degradation rate is a function of the wastes' environment or surroundings. For example, a waste exposed to the atmosphere may be degraded by the process of photolysis (solar degradation) or hydrolysis (breakdown in water). In the soil, biodegradation may result from enzymatic actions. Degradation rates are higher in the uppermost portions of a soil profile because there is greater exposure to air, microorganisms and other biota which promote degradation. Therefore a substance remaining in the upper levels of soil will be more subject to degradation than one moving rapidly through the soil. Similarly, certain biodegradable substances, such as organic chemicals, are less likely to migrate to ground water in a hazardous state than non-biodegradable substances because microorganisms in the upper levels of the soil will cause them to degrade before they reach greater soil depths and the ground water.

- **Volatility**: The volatility of a substance refers to its tendency to separate into liquid and gas. This tendency depends upon such factors as the concentration of the substance, temperature, and vapor pressure. Certain organic solvents are highly volatile.

- **Solubility**: Solubility is the ability of a substance to be dissolved in liquids. A waste with highly soluble hazardous components (e.g., formaldehyde and phenol) would form a leachate with higher concentrations of hazardous constituents than a waste with hazardous components low in solubility (e.g., metals), given equal amounts of water and waste. Wastes with a high solubility will more readily travel from the waste disposal unit as leachate if water infiltrates through the cover and into the waste disposal unit and be more likely to contaminate the ground water than insoluble compounds. Moreover, wastes that are not readily degradable will have an even higher potential for contaminating ground water.

- **Adsorptivity**: Adsorptivity measures the tendency of a substance to cling to soil particles. Wastes containing substances with high adsorptivity, such as PCBs and lead, are easily bound to the soil, thus restricting their movement through soil to ground water. Therefore, while lead is not biodegradable, lead concentration in leachate will be attenuated due to adsorption.

- **Bioaccumulation**: Substances with a high bioaccumulation rate,[5] such as PCBs, tend to accumulate in the tissues of plants or wildlife.

- **Kinematic viscosity**: The kinematic viscosity of a substance indicates the relative rate at which a fluid containing the substance would flow. Substances with low kinematic viscosity, such as many organic solvents, would form a leachate which flows more rapidly than water. Like adsorptivity, kinematic viscosity would indicate how rapidly a leachate might move toward ground water.

- **Toxicity**: A chemical causes **acute toxicity** if it leads to death or an illness soon after exposure. **Chronic toxicity** is associated with low levels of exposure to certain chemicals over long periods of time (e.g., exposures to a contaminated drinking water source). Chronic responses may include cancer or birth defects. A chemical may cause both acute and chronic toxic responses. **The type of response is generally a function of the level and pathway of exposure**. However, some substances can be acutely toxic even in minute quantities (e.g., arsenic, lead, mercury, and toxaphene).

In summary, an evaluation of the chemical and physical properties of a waste should indicate the potential for a waste reaching the ground water. For example, a waste with a very slow degradation rate but a low level of toxicity may cause less harm to the environment than a waste that degrades rapidly but is highly toxic. Consequently, post-closure care and monitoring may be extended for those wastes that would impose a higher degree of hazard over the long-term if released. Scenarios 4 and 5 in Exhibit B-2 illustrate how information about waste characteristics might be used in a facility evaluation.

---

[5] The octanol-water partition coefficient is often used as a relative measure of the ability of a chemical to partition into the fatty tissues of an organism and therefore bio-accumulate.

B.2.3 Environmental and Health Considerations

Environmental considerations include information about the **soil, ground water, topography, and climate** such as:

- **Unsaturated zone (soil)**
  - identity of the subsurface media (e.g., soil and/or rock);
  - chemical composition of soil subsurface media;
  - soil porosity/bulk density/hydraulic conductivity;
  - type of surface soils.
- **Saturated zone (ground water)**
  - depth to ground water, distance to wells;
  - hydraulic gradient and hydraulic conductivity;
  - structural/geologic features (e.g., existence of aquitards, regions of relative impermeability acting as barriers to the movement of ground water);
  - ground water use;
  - direction and rate of ground-water flow.
- **Topography and Geography**
  - distance to surface water;
  - distance to property boundaries;
  - land formations, and other relevant features of the facility and site;
  - surface run-off patterns.
- **Climatological Conditions**
  - weather patterns;
  - precipitation;
  - temperature.

Waste constituents or their subsequent degradation or transformation products released to the environment also may pose risks to human health. While consumption of contaminated drinking water directly threatens human health, consumption of food products which have bioaccumulated toxic substances indirectly affects human health. **Population density, uses of ground and surface water, and present and potential surrounding land use should be considered when gauging potential exposures and thus the cumulative level of risk.**[6] Scenarios 6 and 7 in Exhibit B-2 describe situations in which the population at risk would enter into the deliberations concerning post-closure care.

---

[6] Strategies for protecting ground water have been a recent subject of EPA attention. Several states have also begun developing ground-water protection strategies. See: Environmental Protection Agency, "A Ground Water Protection Strategy for the Environmental Protection Agency," August 1984.

APPENDIX C

CLOSURE, CONTINGENT CLOSURE, AND POST-CLOSURE PLAN CHECKLISTS

This appendix contains checklists which identify the necessary types of information that should be addressed in a closure or post-closure plan. A closure plan checklist is provided for seven major types of hazardous waste management units:

- Container Storage and Handling Units;
- Tank Storage and Treatment Systems;
- Surface Impoundments;
- Waste Piles;
- Land Treatment;
- Landfills; and
- Incineration Systems.

Also included is a checklist identifying the activities to be included in a contingent closure plan required for permitted surface impoundments and waste piles that do not satisfy the specified liner requirements, and for permitted and interim status tank systems without secondary containment (see Section 2.1.3 of the main text). In addition, a post-closure plan checklist applicable to all facilities with disposal units is provided.

This appendix does not include checklisks for miscellaneous hazardous waste technologies, such as placement of wastes in underground mines, thermal treatment other than incinerators (e.g., molten-salt pyrolysis, wet-air oxidation), open burning/open detonation of explosive wastes, certain chemical, physical, and biological treatment units, some water disposal activities, and research in miscellaneous units. These checklists may be provided at a later date as updates to this guidance manual.

The purpose of the checklists is to indicate the types of information to be included in a plan and to present a suggested format for organizing the information. The checklists also include the applicable regulatory citations for reference. The closure plan checklists are organized into three major sections:

- **Facility Description** -- Discusses design and operating information about the unit and the relationship of the unit to other hazardous waste management units, if any, at the facility to provide a basis for discussions of closure procedures;[1]

---

[1] Where a Part B permit application has been submitted for the unit, much if not all of the information listed under Facility Description will have been presented in the application. The closure plan need only reference the appropriate sections of the Part B application where this information is to be found.

- **Closure Procedures** -- Describes the steps necessary to perform closure of the unit; and

- **Closure Schedule** -- Presents timing and scheduling information for all of the partial and final closure activities.

The suggested format for the post-closure plan checklist conforms to the key post-closure care activities, namely monitoring and routine maintenance activities.

Each checklist is designed to address all the possible types of information that may be necessary to include in a plan for that specific process type unit. Because site-specific conditions play a considerable role in shaping closure and post-closure plans, not all items on the checklist may be applicable to a particular unit or facility. For example, if all waste inventory from the closure of a tank storage system is to be sent off site for disposal, there will be no need to describe on-site treatment or disposal methods for these wastes. Similarly, if it can be demonstrated that there will always be sufficient capacity available in an operating landfill cell to dispose of waste inventory at any time during the active life of the facility, then there will be no need to provide information on the design and construction of a new cell.

For the convenience of the checklist user, each item on the checklist includes a space to note whether the specific information is provided in the plan or is "not applicable". In addition, it includes a corresponding space on the page to accommodate a brief written comment or note explaining why certain information is not applicable. This information may help to serve as an outline in preparing the closure plan, as well as a management tool for reviewing the plans.

In preparing or reviewing a closure plan for a multiple process facility, the user should refer to each of the applicable process-specific checklists. For example, for a facility comprised of container storage and handling units, tank treatment, and landfills, all three checklists should be used. Because the checklists address activities on a per-unit basis, the landfill checklist, for example, does not address the procedures for removing and handling the waste inventory associated with the treatment tank system. In preparing the closure plan, however, the owner or operator may choose to describe certain closure activities on a per-facility basis (see Section 2.2 of the main text).

CLOSURE PLAN CHECKLIST:

CONTAINER STORAGE AND HANDLING UNITS

ICF INCORPORATED

EPA I.D. ______________

CLOSURE PLAN CHECKLIST
CONTAINER STORAGE AND HANDLING UNITS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. **FACILITY DESCRIPTION**	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Container storage unit description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Capacity: number and size of containers				
o Storage area design & ancillary equipment (including layout sketch)				
o Secondary containment design				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. **CLOSURE PROCEDURES**				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.178			
o Containers				
o Bulk wastes				
o Residues				
o Empty containers				

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
CONTAINER STORAGE AND HANDLING UNITS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.178			
o On-site treatment		____	____	____
o On-site disposal		____	____	____
o Transportation distance off-site		____	____	____
o Off-site treatment		____	____	____
o Off-site disposal		____	____	____
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.178			
o Equipment/structures decontamination (address sampling protocol)		____	____	____
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal		____	____	____
-- Off-site treatment/disposal		____	____	____
o Equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal		____	____	____
-- Off-site treatment/disposal		____	____	____
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas		____	____	____
-- Estimated amount of contaminated soil to be removed (address sampling protocol)		____	____	____
-- Soil removal methods		____	____	____
-- On-site disposal		____	____	____
-- Off-site disposal		____	____	____

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
CONTAINER STORAGE AND HANDLING UNITS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system		____	____	____
o Fence or natural barrier		____	____	____
2.5 Closure certification:	264.115/265.115			
o Activities to be conducted		____	____	____
o Testing and analyses to be performed		____	____	____
o Criteria for evaluating adequacy		____	____	____
o Schedule of inspections		____	____	____
o Types of documentation		____	____	____
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Expected year of closure	264.112(b)(7)/265.112(b)(7)	____	____	____
3.2 Frequency of partial closures		____	____	____
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)	____	____	____
o Decontamination equipment/structures		____	____	____
o Equipment, structures demolition and soil removal/disposal		____	____	____
o Total time to close	264.113(b)/265.113(b)	____	____	____
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)	____	____	____

CLOSURE PLAN CHECKLIST:

TANK STORAGE AND TREATMENT SYSTEMS

ICF INCORPORATED

EPA I.D. ____________________

CLOSURE PLAN CHECKLIST
TANK STORAGE AND TREATMENT SYSTEMS*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Tank system description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Capacity: type, number and size of tanks				
o Tank area design & ancillary equipment (including layout sketch)				
o Secondary containment and leak detection system design				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.197/265.197			
o Pumpable wastes in tanks				
o Residues in tanks				
o Contaminated containment liquids				

* See also Contingent Closure Plan Checklist for tank systems without secondary containment.

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
TANK STORAGE AND TREATMENT SYSTEMS*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.197(a)/265.197(a)			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.197/ 265.197			
o Tanks and other equipment/structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Tanks and other equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				

* See also Contingent Closure Plan Checklist for tank systems without secondary containment.

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
TANK STORAGE AND TREATMENT SYSTEMS*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o Fence or natural barrier				
2.5 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE				
3.1 Expected year of closure	264.112(b)(6)/265.112(b)(6)			
3.2 Frequency of partial closures	264.112(b)(7)/265.112(b)(7)			
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)			
o Decontamination of tanks and equipment/structures				
o Tanks, equipment, and structures demolition and soil removal/disposal				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

* See also Contingent Closure Plan Checklist for tank systems without secondary containment.

CLOSURE PLAN CHECKLIST:

SURFACE IMPOUNDMENTS AT WHICH ALL WASTES ARE REMOVED

ICF INCORPORATED

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: ALL HAZARDOUS WASTES REMOVED*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Surface impoundments description:				
o Wastes managed (EPA hazardous waste numbers and quantities)				
o Number and size (aerial dimensions and depth) of impoundments (including engineering drawings)				
o Liner systems and leachate collection systems design				
o Run-on and run-off control systems				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.228(a)/265.228(a)			
o Pumpable wastes in the impoundments				
o Bottom sludges/residues in the impoundments				
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.228(a)/265.228			

* See also Contingent Closure Plan Checklist for permitted impoundments without liner systems as specified in Section 264.221(a) (i.e., double liners)

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: ALL HAZARDOUS WASTES REMOVED*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.228(a)/265.228(a)			
o Equipment/structures (piping, pumps) decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Containment systems (liners, dikes) and other equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Other contaminated soil removal:	264.228(a)/265.228(a)			
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				
o Protocol for deteriming "clean" closure				

---

* See also Contingent Closure Plan Checklist for permitted impoundments without liner systems as specified in Section 264.221(a) (i.e., double liners)

EPA I.D. ____________________

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: ALL HAZARDOUS WASTES REMOVED*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
o Number, location and frequency of samples				
o Procedures for analysis				
2.5 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o Fence or natural barrier				
2.6 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Expected year of closure	264.112(b)(7)/265.112(b)(7)			
3.2 Frequency of partial closures				
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)			
o Decontamination of equipment/ structures				
o Containment systems, equipment, and structures demolition and soil removal/disposal				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

* See also Contingent Closure Plan Checklist for permitted impoundments without liner systems as specified in Section 264.221(a) (i.e., double liners)

CLOSURE PLAN CHECKLIST:

DISPOSAL SURFACE IMPOUNDMENTS

ICF INCORPORATED

13

Page 1 of 4

EPA I.D. ______________

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water, soil, and geologic conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Surface impoundment description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Number and size (aerial dimensions and depth) of impoundments (including engineering drawings)				
o Liner systems and leachate collection systems design				
o Run-on and run-off control systems				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.228(a)/265.228(c)			
o Pumpable wastes in the impoundments				
o Bottom sludges/residues in the impoundments				
2.2 Procedures for handling inventory to be treated/stabilized and replaced in the impoundments (consistent with land disposal restrictions under Part 268):	264.228(a)(2)/265.228(c)			

EPA I.D. ______________

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Waste types and quantities				
o Treatment methods				
o Type and amount of stabilization reagent				
2.3 Procedures for handling other removed inventory (address quantities, waste types, methods)	264.112(b)(3)/265.112(b)(3); 264.228/265.228			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.4 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.228/265.228			
o Equipment/structures (piping, pumps) decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				
2.5 Final cover design (including engineering drawings):	264.228(a)(2)/265.228(c)			
o Area covered				
o Cover characteristics:				
-- Material type				
-- Permeability				
-- Depth				
-- Slope				
-- Drainage structures				
-- Vegetation				
o Installation procedures (equipment and labor requirements)				
2.6 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
o Types of analyses:				
-- Number, location, and frequency				
-- Procedures for analyses				
o Maintenance of equipment				
2.7 Description of security systems	264.14(b) and (c)/ 265.14(b) and (c)			
o Existing facility fence maintenance				
o Additional fencing at closure				
o Other security equipment				
2.8 Survey plat	264.116/265.116			
2.9 Closure certification:	264.115/265.115			
o Activities to be conducted				

EPA I.D. ____________ Page 4 of 4

CLOSURE PLAN CHECKLIST
SURFACE IMPOUNDMENTS: CLOSURE AS A LANDFILL

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Testing and analyses to be performed		____	____	____
o Criteria for evaluating adequacy		____	____	____
o Schedule of inspections		____	____	____
o Types of documentation		____	____	____
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Estimated year of closure	264.112(b)(7)/265.112(b)(7)	____	____	____
3.2 Frequency of partial closures		____	____	____
3.3 Milestone chart showing time for:				
o Removal, treatment, disposal of inventory	264.113(a)/265.113(a)	____	____	____
o Decontamination of equipment/ structures and soil removal/ disposal		____	____	____
o Closure cover installation		____	____	____
o Total time to close	264.113(b)/265.113(b)	____	____	____
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)	____	____	____

CLOSURE PLAN CHECKLIST:

WASTE PILES

ICF INCORPORATED

18

EPA I.D. ____________________

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Waste piles description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Number and size of waste piles				
o Roof area and containment system design (including engineering drawings)				
o Liner system and leachate collection system design				
o Run-on and run-off control system				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3); 264.258(a)/265.258(a)			
o Wastes in piles				
o Leachates				
o Contaminated containment liquids				

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

EPA I.D. ____________________

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.2 Procedures for handling removed inventory (address quantities, waste types, methods):	264.112(b)(3)/265.112(b)(3); 264.258(a)/265.258(a)			
o On-site treatment				
o On-site disposal				
o Transportation distance off-site				
o Off-site treatment				
o Off-site disposal				
2.3 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114; 264.258/ 265.258			
o Pile base and other equipment/ structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Pile base and other equipment/ structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				

---

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.4 Leachate management:	264.112(b)(5)/265.112(b)(5)			
o Estimate of volumes collected		____	____	____
o Treatment and disposal methods:				
-- On-site		____	____	____
-- Off-site		____	____	____
2.5 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90; 264.250(c)			
o Number, location and frequency of samples		____	____	____
o Procedures for analyses		____	____	____
2.6 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system		____	____	____
o Fence or natural barrier		____	____	____
2.7 Closure certification:	264.115/265.115			
o Activities to be conducted		____	____	____
o Testing and analyses to be performed		____	____	____
o Criteria for evaluating adequacy		____	____	____
o Schedule of inspections		____	____	____
o Types of documentation		____	____	____
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Expected year of closure	264.112(b)(7)/265.112(b)(7)	____	____	____
3.2 Frequency of partial closures		____	____	____
3.3 Milestone chart showing time for:				
o Removal, treatment or disposal of inventory	264.113(a)/265.113(a)	____	____	____
o Decontamination of pile base and equipment/structures		____	____	____

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e. single liner)

EPA I.D. ______________

CLOSURE PLAN CHECKLIST
WASTE PILES*

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Pile base, equipment, and structures demolition and soil removal/disposal		______	______	______
o Total time to close	264.113(b)/265.113(b)	______	______	______
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)	______	______	______

---

* See also Contingent Closure Plan Checklist for permitted waste piles without liner systems as specified in Section 264.251(a) (i.e., single liner)

CLOSURE PLAN CHECKLIST:

LAND TREATMENT

ICF INCORPORATED

CLOSURE PLAN CHECKLIST
LAND TREATMENT

EPA I.D. ____________

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water, soil, and geologic conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Land treatment system description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Number, size (aerial dimensions and depth), and capacity of each land treatment zone (including engineering drawings)				
o Application rates				
o Run-on and run-off control systems				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory by waste type:	264.112(b)(3)/265.112(b)(3)			
o Wastes to be spread at closure				
o Run-off from land treatment fields				
2.2 Procedures for disposing of inventory and other wastes:	264.112(b)(3)/265.112(b)(3); 264.280/265.280			
o Procedures for landspreading wastes:				

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
LAND TREATMENT

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
-- Landspreading management procedures		____	____	____
-- Application rates		____	____	____
-- Acreage required		____	____	____
o Procedures for handling other waste inventory and run-on/run-off (address quantities, types, and methods):				
-- On-site		____	____	____
-- Off-site		____	____	____
o Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.114/265.114			
-- Equipment/structure decontamination		____	____	____
-- Cleaning agent rinsewater/treatment or disposal (address, quantities, and methods such as on-site or off-site)		____	____	____
-- Equipment/structures demolition (address, quantities, and methods such as on-site or off-site)		____	____	____
2.3 Procedures to continue land treatment processes:	264.280/265.280			
o Activities to be conducted during closure (disking, liming, irrigation)		____	____	____
o Procedures for controlling wind dispersal		____	____	____
2.4 Procedures for contaminated soil removal:				
o List or sketch of potentially contaminated areas		____	____	____
o Estimated amount of contaminated soil to be removed		____	____	____
o Soil removal methods		____	____	____

EPA I.D. ______________

CLOSURE PLAN CHECKLIST
LAND TREATMENT

	SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
	o On-site disposal				
	o Off-site disposal				
2.5	Procedures for compliance with food-chain crop prohibitions	264.280(a)/265.280(a)			
	o Type of crop				
	o Analyses to be conducted				
2.6	Vegetative cover design (including engineering drawings):	264.280(a)/265.280(c)			
	o Area covered				
	o Vegetation characteristics:				
	-- Name				
	-- Environmental requirements				
	o Soil preparation				
2.7	Soil monitoring	264.280(a)(7)/265.280(d)			
	o Types of monitoring (soil sampling, soil-pore liquid sampling)				
	o Frequency analyses conducted				
2.8	Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90;265.280(c)			
	o Types of analyses:				
	-- Number, location, and frequency				
	-- Procedures for analyses				
	o Maintenance of equipment				
2.9	Description of security systems	264.14(b) and (c)/ 265.14(b) and (c)			
	o Existing facility fence maintenance				
	o Additional fencing at closure				
	o Other security equipment				
2.10	Survey plat	264.116/265.116			

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
LAND TREATMENT

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.11 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Estimated year of closure	264.112(b)(7)/265.112(b)(7)			
3.2 Frequency of partial closures				
3.3 Milestones chart showing time for:				
o Landspreading wastes				
o Other waste disposal	264.113(a)/265.113(a)			
o Continued waste degradation				
o Vegetative cover installation				
o Total time to close	264.113(b)/265.113(b)			
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)			

CLOSURE PLAN CHECKLIST:

LANDFILLS

ICF INCORPORATED

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water, soil, and geologic conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Landfill description:				
o Wastes managed (EPA hazardous waste numbers & quantities)				
o Size (aerial dimensions & depth)				
o Number of landfill trenches or cells (including engineering drawings)				
o Maximum number and size of trenches or cells ever open at any time (existing or proposed)				
o Liner systems				
o Leachate collection systems				
o Run-on and run-off control systems				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory by waste type to be landfilled (consistent with land disposal restrictions under Part 268):	264.112(b)(3)/265.112(b)(3)			

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Containerized wastes				
o Bulk wastes				
o Decontamination wastes				
o Demolition wastes				
o Contaminated soil (from other activities)				
2.2 Procedures for disposing of inventory and other wastes:	264.112(b)(3)/ 265.112(b)(3)			
o Closure cell construction (including engineering drawings):				
-- Trench excavation & liner installation				
-- Leachate system installation				
-- Run-on and run-off control system				
-- Ground-water monitoring system				
o Procedures for landfilling wastes:				
-- Equipment to be used				
-- Special requirements for incompatible, ignitable, or reactive wastes				
-- Soil, other material, and labor requirements				
o Procedures for decontamination and/or disposal:				
-- Equipment/structure decontamination				
-- Cleaning agent rinsewater/treatment or disposal (address, quantities, and methods such as on-site or off-site)				
-- Equipment/structures demolition (address, quantities, and methods such as on-site or off-site)				

EPA I.D. ____________________

CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Procedures for contaminated soil removal and disposal (landfilling activities):				
-- List or sketch of potentially contaminated areas				
-- Criteria for determining contamination				
-- Estimated amount of contaminated soil to be removed				
o Procedures for managing incident precipitation:				
-- Amount to be removed from cell and method of treatment/ disposal				
-- Amount to be managed via leachate system (after closure)				
2.3 Final cover design (including engineering drawings):	264.310/265.310			
o Area covered				
o Cover characteristics:				
-- Material type				
-- Permeability				
-- Depth				
-- Slope				
-- Drainage structures				
-- Vegetation				
o Installation procedures (equipment and labor requirements)				
2.4 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
o Types of analyses:				
-- Number, location, and frequency				
-- Procedures for analyses				
o Maintenance of equipment				

CLOSURE PLAN CHECKLIST
LANDFILLS

EPA I.D. ______________

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2.5 Leachate management:	264.112(b)(5)/265.112(b)(5); 264.301(a)(2)			
o Estimate of volumes collected				
o Treatment and disposal methods:				
-- On-site				
-- Off-site				
2.6 Gas collection and control:	264.112(b)(5)/265.112(b)(5)			
o Well location and pipeline configuration				
o Gas processing facility				
2.7 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Existing facility fence maintenance				
o Additional fencing at closure				
o Other security equipment				
2.8 Survey plat	264.116/265.116			
2.9 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Estimated year of closure	264.112(b)(7)/265.112(b)(7)			
3.2 Frequency of partial closures				
3.3 Milestone chart showing time for:				
o Closure cell construction				
o Inventory disposal in landfill	264.113(a)/265.113(a)			

EPA I.D. ____________________

CLOSURE PLAN CHECKLIST
LANDFILLS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
o Contaminated soil disposal		______	______	____________
o Closure cover installation		______	______	____________
o Waste disposal via other methods		______	______	____________
o Total time to close	264.113(b)/265.113(b)	______	______	____________
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)	______	______	____________

CLOSURE PLAN CHECKLIST:

INCINERATION SYSTEMS

ICF INCORPORATED

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. FACILITY DESCRIPTION	264.111/265.111			
1.1 General description (e.g., size, location)				
1.2 Topographic map				
1.3 List of other HWM units and wastes handled in each				
1.4 Hydrogeologic information:				
o Ground-water and soil conditions				
o Ground-water monitoring systems				
o Corrective actions				
1.5 Incineration system description:				
o Overall system description (include layout sketch)				
o Wastes managed (EPA hazardous waste numbers and throughput) and chemical and physical characteristics of feed blends (e.g., caloric values, viscosities, chlorine concentration)				
o Combustion unit design type and capacity (i.e., rotary kiln)				
o Waste handling systems design (i.e., pumps, ram feeders)				
o Emission control system (i.e., gas conditioners, scrubbers, cyclones, baghouses, electrostatic precipitators)				
o Residuals handling system (i.e., ash conveyors, scrubber water treatment facilities)				
1.6 References to other environmental permits (NPDES, UIC, TSCA)				
1.7 Anticipated waivers or exemptions				

EPA I.D. ____________

CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
2. CLOSURE PROCEDURES				
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	264.112(b)(3)/265.112(b)(3)			
o Containerized wastes				
o Bulk liquid wastes				
o Bulk solid wastes				
o Incineration residuals (ash, scrubber effluents)				
2.2 Procedures for handling wastes to be incinerated on-site:	264.112(b)(3)/265.112(b)(3); 264.345/265.345			
o Quantities				
o Waste types				
o Operating conditions (address auxiliary fuel requirements, time to incinerate)				
o Monitoring and inspection activities	264.347/265.347			
2.3 Procedures for handling wastes not to be incinerated, including incinerator ash and scrubber effluents generated duirng closure (address quantities, types, and methods):				
o On-site treatment/disposal				
o Off-site transportation				
o Off-site treatment/disposal				
2.4 Procedures for decontamination and/or disposal:	264.112(b)(4)/265.112(b)(4); 264.351/265.351			
o Equipment/structures decontamination (address sampling protocol)				
o Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):				
-- On-site treatment/disposal				

EPA I.D. ______________

CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
-- Off-site treatment/disposal				
o Equipment/structures demolition and removal (address quantities and methods):				
-- On-site treatment/disposal				
-- Off-site treatment/disposal				
o Contaminated soil removal:				
-- List or sketch of potentially contaminated areas				
-- Estimated amount of contaminated soil to be removed (address sampling protocol)				
-- Soil removal methods				
-- On-site disposal				
-- Off-site disposal				
2.5 Description of security systems:	264.14(b) and (c)/ 265.14(b) and (c)			
o Posted signs and 24-hour surveillance system				
o Fence or natural barrier				
2.6 Closure certification:	264.115/265.115			
o Activities to be conducted				
o Testing and analyses to be performed				
o Criteria for evaluating adequacy				
o Schedule of inspections				
o Types of documentation				
3. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
3.1 Estimated year of closure	264.112(b)(7)/265.112(b)(7)			
3.2 Frequency of partial closures				

CLOSURE PLAN CHECKLIST
INCINERATION SYSTEMS

EPA I.D. ______________

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
3.3 Milestones chart showing time for:				
o Incineration or removal, treatment and disposal of inventory (and incineration residuals)	264.113(a)/265.113(a)	______	______	______
o Decontamination equipment/structures		______	______	______
o Equipment, structures demolition and soil removal/disposal		______	______	______
o Total time to close	264.113(b)/265.113(b)	______	______	______
3.4 Request for extension to deadlines for handling inventory or completing closure	264.113(c)/265.113(c)	______	______	______

OSWER Policy Directive
#9476.00-5

CONTINGENT CLOSURE PLAN CHECKLIST:

CERTAIN TANK SYSTEMS, WASTE PILES, AND SURFACE IMPOUNDMENTS

ICF INCORPORATED

EPA I.D. ________________

CONTINGENT CLOSURE PLAN CHECKLIST
CERTAIN TANK SYSTEMS, WASTE PILES, SURFACE IMPOUNDMENTS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. CLOSURE PROCEDURES				
1.1 Final cover design (including engineering drawings):	264.310/265.310			
o Area covered				
o Cover characteristics:				
-- Material type				
-- Permeability				
-- Depth				
-- Slope				
-- Drainage structures				
-- Vegetation (type, soil preparation procedures)				
o Installation procedures (equipment and labor requirements)				
o Erosion control procedures				
1.2 Ground-water monitoring:	264.112(b)(5)/265.112(b)(5); 264.90/265.90			
o Well installation:				
-- Number, location, and depth of wells				
-- Method of construction				
o Types of analyses:				
-- Number, location, and frequency				
-- Procedures for analyses				
o Maintenance of equipment				
1.3 Description of security systems:	264.14/265.14			
o Existing facility fence maintenance				
o Additional fencing at closure				
o Other security equipment				

EPA I.D. ____ __________

CONTINGENT CLOSURE PLAN CHECKLIST
CERTAIN TANK SYSTEMS, WASTE PILES, SURFACE IMPOUNDMENTS

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1.4 Survey plat	264.116/265.116			
2. CLOSURE SCHEDULE	264.112(b)(6)/265.112(b)(6)			
2.1 Milestone chart showing time for:				
o Closure cover installation				
o Vegetation planting				
o Total time to complete closure	264.113(b)/265.113(b)			
2.2 Request for extension to deadline for completing closure	264.113(c)/265.113(c)			

OSWER Policy Directive
#9476.00-5

POST-CLOSURE PLAN CHECKLIST

ICF INCORPORATED

42

EPA I.D. ____________

POST-CLOSURE PLAN CHECKLIST

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
1. GROUND-WATER MONITORING	264.118(b)(1)/265.118(b)(1); 264.310(b)/265.310(b); 265.90/265.90			
1.1 Number, location, and depth of wells				
1.2 Frequency of sampling				
1.3 Types of analyses to be conducted				
1.4 Procedures for sampling and analyses (including party responsible)				
2. SOIL MONITORING	264.118(b)(1)/265.118(b)(1); 264.280(d)(1)/265.280(d)(1)			
2.1 Number and frequency of samples				
2.2 Types of analyses to be conducted				
2.3 Procedures for sampling (including party responsible)				
3. LEACHATE MONITORING AND REMOVAL	264.118(b); 264.310(b)(2)			
3.1 Monitoring procedures and frequency of monitoring				
3.2 Estimated quantity of leachate				
3.3 Procedures for collecting and removing leachate				
3.4 Procedures for treatment and disposal:				
o On-site				
o Off-site				
3.5 Party responsible				
4. INSPECTIONS	264.118(b)(2)/265.118(b)(2)			
4.1 List of structures and facilities to be inspected				
4.2 Frequency of inspections				
4.3 Party responsible				

POST-CLOSURE PLAN CHECKLIST

EPA I.D. ______________

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
5. MAINTENANCE ACTIVITIES	264.118(b)(2)/265.118(b)(2); 264.310(b)/265.310(b)			
5.1 Maintenance of final cover:				
o Mowing and fertilizing		______	______	______
o Replacing lost soil and reseeding		______	______	______
o Maintaining drainage channels and culverts		______	______	______
o Controlling rodents and insects		______	______	______
o Contingency plans for damage caused by severe storms or natural events		______	______	______
5.2 Maintenance of monitoring systems:				
o Monitoring well replacement/ redrilling		______	______	______
o Sampling pump replacement		______	______	______
o Other equipment maintenance		______	______	______
5.3 Maintenance of security systems:	264.117(c)/265.117(c)			
o Fence, warning signs, and gates maintenance		______	______	______
o Responsible party		______	______	______
6. CONTINUATION OF LAND TREATMENT PROCESSES	264.280/265.280			
6.1 Procedures for continued degradation of hazardous constituents (disking, fertilizing, liming, irrigation)		______	______	______
6.2 Procedures for controlling run-on and run-off:				
o Drainage system and erosion repair		______	______	______
o Run-off quantities and handling methods		______	______	______
6.3 Procedures for controlling wind dispersal of particulates		______	______	______

EPA I.D. ____________

POST-CLOSURE PLAN CHECKLIST

SUBJECT REQUIREMENT	PART 264/265	PROVIDED	NOT APPLICABLE	COMMENTS
6.4 Procedures to determine level of hazardous constituents in the treatment zone:				
o Identification of constituents				
o Number and location of samples				
o Types of analyses				
o Statistical methods				
7. POST-CLOSURE NOTICES	264.119/265.119			
7.1 Record of wastes:				
o Sources of information				
o Types of information to be included				
7.2 Notation on deed:				
o Schedule for filing notice				
o Location of filing				
7.3 Name, address, and phone number of contact person				
8. POST-CLOSURE CERTIFICATION	264.120/265.120			
8.1 Estimated number of inspections				
8.2 Testing and analyses to be performed				
8.3 Types of documentation				